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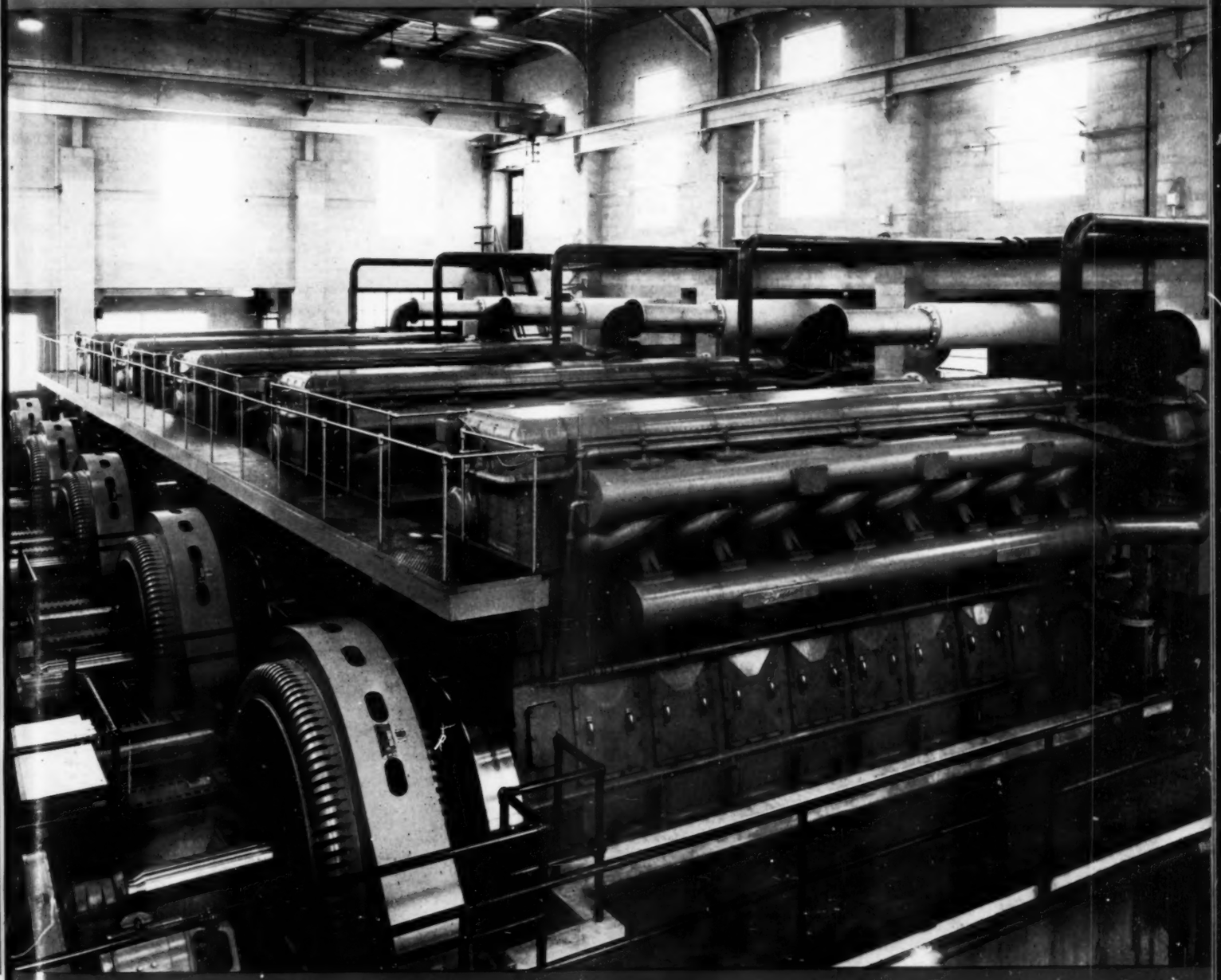

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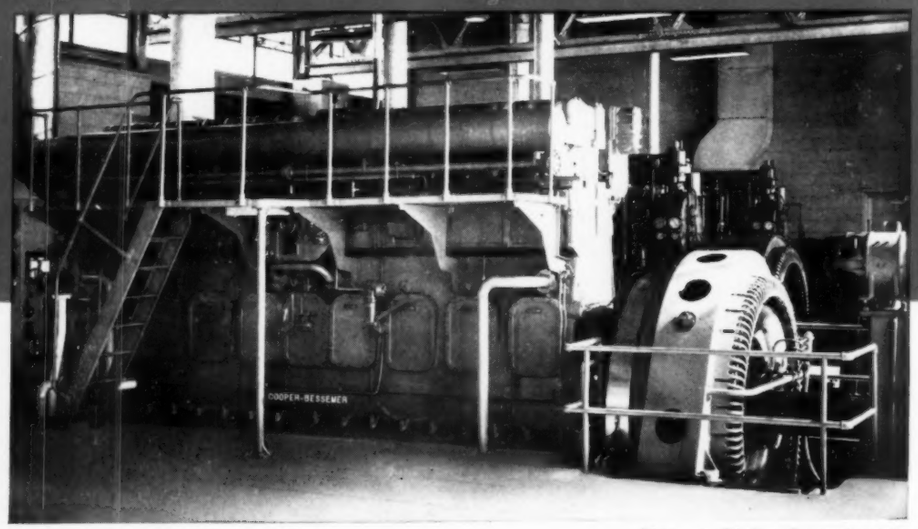

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DIESEL and GAS ENGINE PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

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SEPTEMBER 1948

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SCARLET QUEEN

WORLD'S LARGEST TUNA CLIPPER

3000 hp. Diesel Plant Replaces 1800 hp. Steam Installation of Former ATR But Permits 675 Tons Refrigerated Cargo Space.

By CHARLES F. A. MANN

TOWARD the latter part of World War II, almost too late to participate in the declining Carrier-Borne aircraft battles, the U. S. Government had a fleet of giant, very heavy steam tugs of the ATR Class-primarily giant Rescue tugs to clean the seas of damaged aircraft after a sea-air battle. Of strictly ocean-going proportions, the tugs were of heaviest wood construction with steel and wood deckhouses and plenty of steel bracing, to withstand shock of explosions and heavy seas and contact with much larger craft. They had large towing winches, large fuel and water capacity and were too big for commercial towing use after the war, either as Navy or Private craft. Their steam plants were uneconomical for everyday use.

One of the best of these hulls was built at a Bellingham,, Wn. shipyard and saw scarcely a year's service, when it became surplus.

The plant of Tacoma Boatbuilding Co. Inc. at Tacoma, Wn., was successful in acquiring one of these steam tugs, in view toward possible carrying the evolution of the Giant Tuna Clipper one step further ahead, toward a long-range craft with 50% greater Tuna carrying capacity than ever before known.

Messers Arne Strom & Haldor Dahl, practical fishermen as well as shipbuilders and designers, undertook the task of resurveying the hull and machinery and devising a plan of practically gutting the whole inside of the lower hull down to the timbers and keel, yet leaving the deckhouse intact, and fitting in the elaborate mechanical and tank Layout of a Tuna Clipper in such a way that when in operating condition, with all tanks full, the craft would ride down low enough in the water, aft, to permit customary pole fishing from galvanized platforms slung over the guardrail, positioned so the foot space was practically touching the surface of the sea.

Drawing originally about 16 feet, the re-designed craft had to be forced two feet deeper into the water from midships aft, yet operate at 12 knots speed without shipping water from the tail wave or the sides more than is customary for craft of this design.

Tacoma Boatbuilding Co.'s Messers Strom & Dahl began their job last Fall, amid the usual Pacific-coastwise howl of derision and doubt. Rival shipbuilders doubted if the enormous tank capacities could be fitted in and still leave room enough for the double-size new diesel plant and some 50 motor driven pumps. Practical Tuna Fishermen in California doubted if the stern could be forced low enough to keep the ship from being what is harshly known as a "Backbreaker" —for in Tunafishing the closer the poles tap Mr. Tuna and yank him aboard to the nearby deck, the more hours a fisherman can withstand this back breaking labor in the broiling tropic sun. Two inches added betwen where he stands on the rack slung over the water and the deck surface can ruin a Tuna Clipper's reputation up and down the whole Pacific from Peru to Astoria, Oregon.

Evolution of the Tuna Clipper has kept apace with three parallel developments—longer runs into the South Pacific; constant upward price of the catch and constant increase in available diesel horsepower per cubic foot of machinery space and weight.

Longer runs South require greater tank capacities on the outbound voyage and hence greater need for bigger payloads on the long run home.

So, the creation of "SCARLET QUEEN" points the way to what may eventually become a 250-foot, 1000-ton Tuna Cliper with a crew of 30 men and a capacity of 125,000 gallons of fuel oil on the outward voyage!

Conversion was completed early in June and test runs made on Puget Sound, both light and loaded down. In the twenty main tanks, all refrigerated, 625 calculated tons of frozen Tuna may be carried, or a combination of live bait and Tuna and Fuel oil. Fresh water has been cut to a mere nominal amount by addition of a 750 GPD fresh water still. Gasoline for operation of the Hydroplane used for scouting purposes, and carried on the aft upper deck, and the small power skiffs totals 1,000 gallons.

It is a craft of superlatives all the way through, having principal dimensions as follows:

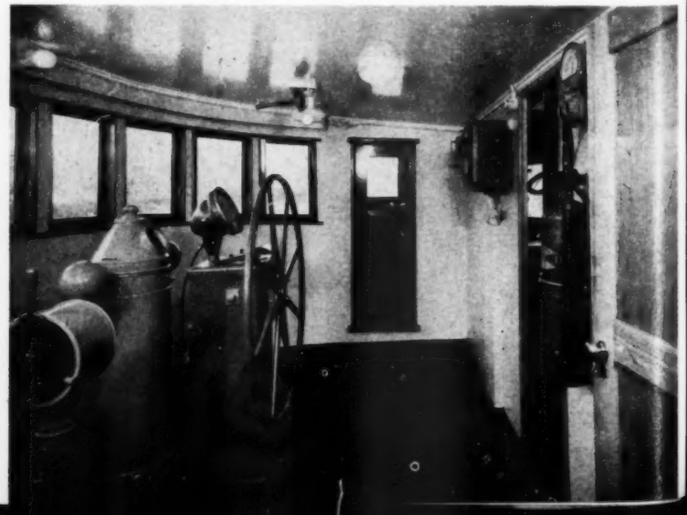
Overall Length	165 ft. 5 inches
Length B. P.	155 ft.
Extreme breadth	34 ft. 1¾ inches
Depth	17 ft. 3 inches
Draft, light	12 ft. 3¾ inches
Draft loaded	18 ft.
Gross Tonnage	691.71
Net Tonnage	370

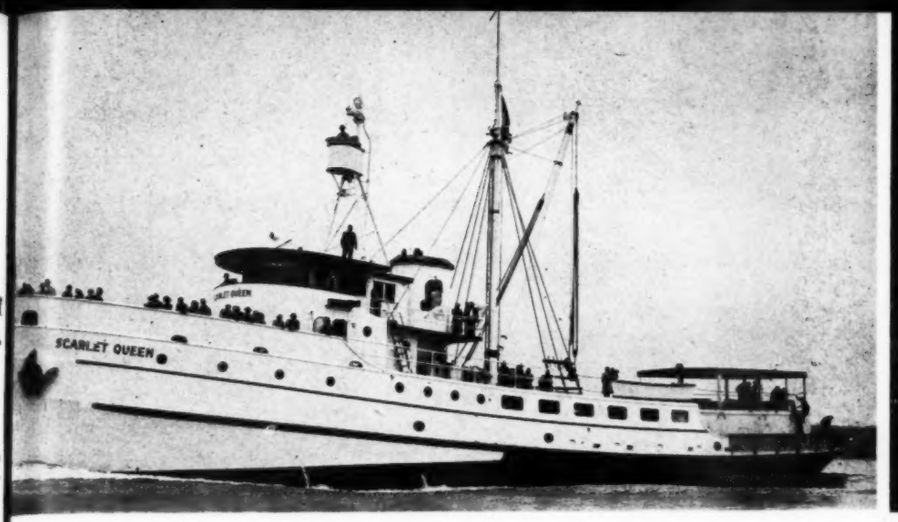
Propulsion machinery occupies what was form-

Left to right: Cecil Drake, part owner and Pacific Coast agent for Avondale Marine Ways of New Orleans; Arne Strom, President, Tacoma Boatbuilding Company; Haldor Dahl, Vice President, Tacoma Boat; Captain A. Dutra, Master and Walter Burrus, Chief Engineer.

In main engine room are two General Motors, 8-cylinder diesels, upper right and left, and a Fairbanks-Morse 1800 hp. main diesel, center, also a G-M, 100 hp. auxiliary diesel, right background.

Wheel house with engine room telegraph, binnacle, and mounted on wheel column, the Sperry Gyrocompas repeater.





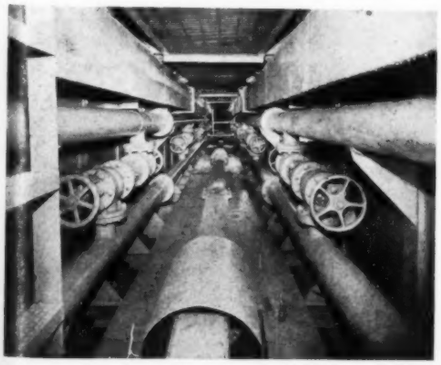
The *Scarlet Queen* on trial run.

View along starboard side of F-M main diesel.

erly the boiler space when she was an 1800 hp. steam reciprocating tug.

Packed into a small area are four Diesel engines, the 1800 hp. 10 cylinder Fairbanks Morse Opposed Piston Diesel engine which delivers its rated output at 800 rpm. The cylinders are 8½ x 10 inch bore and stroke for both upper and lower pistons. This drives through an American Blower Co. fluid coupling, by means of a lineshaft of small size to the 3-1 Reduction gear at the aft end of the shaft alley, where a Western Gear Works Model 101 Reduction gear cuts it down to propellor speed of about 270 RPM under normal operation. The propeller is a 4 bladed 8 ft. 6 inch x 6 ft. 8 inch Coolidge bronze wheel. The old plate rudder was left intact and is now electrically operated by a 5 hp. motor via the Sperry automatic steering installation.

Auxiliary electric power requirements on the vessel are very large, handling besides the ships lighting system, an elaborate refrigeration system, some 50 pumps, the deck machinery, navigation equipment and steering motor. Main current supply is via twin 8 cylinder Model 268 A. General Motors Diesel engines, driving a 312 KVA Columbia 220 volt alternator. The Diesels are rated at 500 hp. each. A third auxiliary set is provided to handle lighting & navigation equipment and galley range, but no pumping load. This unit is a 6 cylinder 671 General Motors 2-cycle unit driving a Bardco 60 kw. A.C. generator. Power from this unit will drive the anchor winch and the bilge pump if the galley load is cut off, plus all ships lighting and navigation requirements, and the galley refrigeration load.



Looking forward in lower shaft alley toward Western Gear Works 3:1 reduction gear.

In order to visualize the Pumping and refrigeration load requirements, an outline of the ships layout is necessary. Below the main deck forward, behind the customary chain lockers and forward tanks is the two-level engine space packed full of machinery. The fresh water still is ahead of the short F.M. main Diesel, with a forward and aft pair of Engine room fuel tanks at the corners of the engine space. The rest of the whole lower hull is just one great big tank and shaft alley-pump room. Eight main tanks on each side are built of wood and cork insulation and lined with coils of ammonia pipes, welded and galvanized into continuous units, for carrying of live bait, frozen tuna and in the case of Tanks 1, 2 & 3, port and starboard, 6 in all, which are lined with steel, fuel oil to the capacity of just under 97 tons may also be carried on the outbound voyage.

In addition to the 16 main tanks, most of which are nearly 14 feet inside depth, largest ever put on a tuna ship, there are four large deck tanks on the rear deck aft, under the customary canopy to keep the sun from injuring the live bait.

Any combination of these 20 tanks may be used,—12 of them can carry live bait outbound, plus four with fuel oil reserve supply, and on the return voyage, the fuel tanks are drained cleaned and filled with Tuna and the refrigeration turned on. As bait is used up, the tanks are trained and filled with frozen fish, until the last deck tank is emptied of bait and filled with frozen fish, then the main fuel tanks with a capacity of about 16,000 gallons are enough to get the precious cargo home, with all main and auxiliary power running wide open to make port in the shortest possible time.

Thus each tank must have provision for filling, pumping out brine or oil and when used for live bait, powerful submerged lights are turned on in the bait tanks to keep fish from killing themselves in the dark, and a large supply of fresh seawater must circulate through the tanks constantly to provide food and oxygen to keep the bait fish alive.

In addition to customary bilge, fire, sanitary, refrigeration, air and oil pumps, a battery of 18 Brine Circulating pumps must be kept to circulate the heavy salt-added brine during the freezing process, as well as two 50 hp. vertical bait-water pumps feeding all tanks through two flat, fabricated watermains strung down the shaft alley walls. The shaft alley is 2 "stories" high, to provide piping, pump space, refrigeration control, etc., and auxiliary access and lighting.

Starting from the top of the crows nest, mounted as it was in wartime use atop a tubular steel tripod high above the pilot house, the former practice of having an "Outdoor pilot house" has given way to a simple, ingenious system of transferring the engine & rudder controls to the crow's nest itself! A Sperry lever steering controller and a Sperry gyrocompass repeater and an Intercommunication system two way speaker direct to the engineers control stand in the engine room, permits navigation without resorting to the use of the Pilot house, when searching the seas for Tuna or Bait. The Radar antenna is mounted above the crows nest.

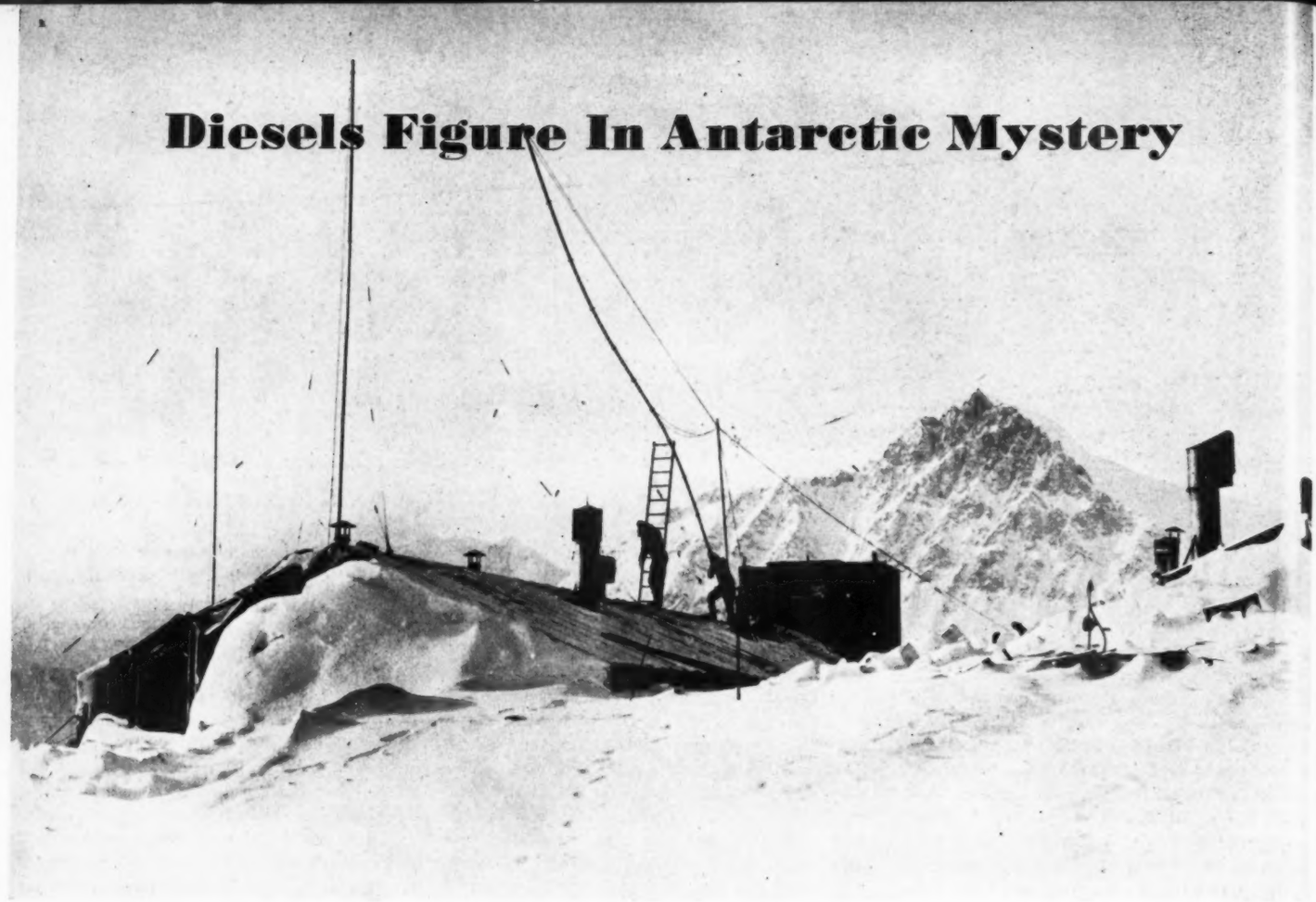
A full Sperry gyrocompass unit with repeaters in the chart room, pilot house and outside the pilot house, in addition to the crows nest, with main Gyro in a separate room on the upper deck, accessible via steep ladder from the pilot house. Sperry electric steering gear, mechanical, electric & automatic is fitted; Hallicrafter world range radio; Intervox Direction finder and Fathometer is fitted, as well as repeating tachometer and intercommunication system to galley crows nest, crews quarters, after deck and engine room. Iimmediately back of the pilot house is the radio & chart room and radio operators quarters.

On the raised deck forward (upper deck) is a large Hyde Windlass, with 60 and 90 fathom lengths of 1¼ in. anchor chain. A crews recreation and storage room occupies the forward space on the deckhouse, followed by Captains quarters and Engineers quarters each with complete toilet facilities. A small Chapel occupies part of the opposite side of the deckhouse. A Maxim muffler for the main diesel and 2 Burgess mufflers for the Auxiliaries and a shop-made muffler for the smaller diesel occupies the lower stack area. A boom winch driven by a 20 hp. Westinghouse motor is fitted.

The gyro room contains all the control panels and accessory equipment, including rectifiers and MG sets for the special electronic equipment aboard the ship.

On the main deck far forward is the large Deck washroom including basins, toilets and showers; a room for Galley stores, followed by two Crews . . . . *And now please turn to page 68* . . . . .

Diesels Figure In Antarctic Mystery



Winter Base in Palmer Land of Ronne Antarctic Research Expedition.

A REMARKABLE record on endurance of machinery in severe climatic areas has been established by the "Dieselectric Plant" of the Witte Engine Works of Oil Well Supply Company, United States Steel subsidiary, in the frozen wastes of the Antarctic. In connection with employment of this equipment and with its upkeep, an additional record of great ingenuity and tenacity on the part of American explorers has been revealed.

The equipment was taken to the Antarctic late in 1939 with the United States Antarctic Service Expedition, headed by Admiral Richard E. Byrd, and was installed for service at the Expedition's East Base in Palmer Land, early in 1940. The location is in the general area of territory over which there has been recent dispute among several nations concerning sovereignty. In connection with this undertaking, evidence has also been revealed of the existence of unknown expeditioners in Palmer Land beyond the tip of South America since 1940.

Exposure through seven years to sub-zero temperatures of the Antarctic had little effect upon the operation of two Witte "Dieselectric" units, a report from Charles Hassage, chief engineer of the Ronne Antarctic Research Expedition, disclosed. The expedition, which returned to the United States in April, reported that the two units of the East Base operated continuously during the long Antarctic winter night to provide steady electric light and power for radio and scientific equipment, as well as other electric appliances. The two "Dieselectric Plants" which figured in the report were single phase 115/230 volt equipment, alternating current sets, rated at 3 and 7½ kva. They were part of a shipment of four generating sets that left the Witte plant at Kansas City on September 19, 1939, consigned to the United States Navy shipyard in Boston. The four units were taken by the expedition to the Antarctic and placed in service at their two wintering bases, to be left there when the group returned to the United States in 1941.

Commander Finn Ronne, second-in-command of the East Base on the first expedition, checked the Witte equipment before the expedition returned to the United States and found it in a state of mechanical perfection for preservation against years of idleness in the extremely low temperature of the region. Because of this personal knowledge, Commander Ronne counted heavily upon use of the Witte units when he returned to the Antarctic in 1947 at the head of the research expedition. He found, however, that both Witte units were inoperative at the time of his arrival.

Charles Hassage, in his operational report on the Witte "Dieselectric" units, announced that an unknown expedition had occupied the East Base at some time between 1941 and 1947 and had used the facilities of the camp without proper maintenance or proper processing before their departure. The Witte "Dieselectric Plants" had been operated and badly damaged. The unknown operator had failed to drain the water from the radiator cooling systems at the time of his departure and the radiator and blocks had been cracked by the ice that resulted. A more than adequate supply of repair parts for the engines had nearly disappeared.

Hard work and American ingenuity displayed by the expedition's engineering staff restored the equipment to a useable condition. The American undertook to improvise the needed repair parts. The cracked cylinder blocks were patched with copper sheeting and screws. The 9-horsepower engines, heart of the 7½ kva. "Dieselectric Plants" required retempering and straightening of bent connecting rods. A crankshaft journal was reground by the expeditioners in a 10-in. lathe, using a straight wet stone mounted in a jig; and a new governor shaft was turned out of cold rolled steel. After several unsuccessful attempts to pour and fit the babbitt bearing, a bronze sheet was machined to the connecting rod.

The engine operated for seven months with this improvised bearing, but the Americans could not on the scene eliminate a heavy pounding that resulted from excessive clearance. This crankshaft pounding finally broke the armature shaft of the 7½ kva. generator after about 300 hours of operation. The break occurred between the exciter

Right: Witte 3 k.v.a. dieselectric plant showing copper sheeting repair to cylinder block done after unknown expedition occupied the American Base and departed without draining the cooling system.

Right, center: William Latady, left, assisting chief engineer Charles Hassage to repair 9 hp. Witte diesel.

and the main winding, and the Hassage report showed that it probably would not have happened if they had been able to use the proper babbitt bearing on the engine.

A 4-hp. engine was repaired by patching the cylinder block with copper sheeting, and the cracked cylinder liner with a brass overlap ring held in place by brass screws. A new crankshaft was installed.

"While repairing the 'Dieselectric Plant,' I found the accessibility of its design very satisfying," he said. "The Witte's were the heart of Commander Ronne's Antarctic Expedition.

Although a new crankshaft and several other miscellaneous parts for the 4-hp. engine were found in the parts room of the base, all parts of the 9-hp. engine with the exception of a few gadgets were missing.

Hassage said that a part of these, at least, for the 9-hp. engine were used by the British supply ship "Trepassey" to repair the 7½ kva. Witte "Dieselectric Plant" they had aboard as they only source of electric power for the vessel. The "Trepassey" on a return trip gave Hassage a new engine block and cylinder liner which enabled him to replace the larger of the two generating units in operation.

Since generating units had not heretofore been subjected to such climatic extremes for longer than a year, Commander Ronne took the precaution of including new generators in his list of equipment and supplies to be taken with the expetition to the Antarctic. It was unknown if the extremely low temperatures of the region combined with the moisture in the atmosphere would effect the generator windings. Despite exposure to such climatic extremes, the two original generators were found to be in good condition and were placed in service when the "Dieselectric" plants began operation. The two tests revealed that the 7½ kva. "Dieselectric" plant was producing 30 amperes at 115 volts for 2 hours and 35 minutes and the 3 kva. unit was developing 15 amperes for 3 hours and 44 minutes per gallon of fuel.

The two original generators were returned to the Witte Factory when the Ronne Expedition arrived in the United States at the conclusion of their survey. Preliminary testing indicated that the 3 kva. generator was not impaired by the extremely rugged conditions under which it had operated since it produced its rated capacity when placed in operation. The 7½ kva. generator was not tested, since it arrived at the Witte factory with a broken armature shaft.

"Once in operation," Hassage said, "the set ran 24 hours a day during the long Antarctic winter night. The bronze connecting rod bearing we made pounded, due to excess clearance (an improvised bearing had been machined to the connecting rod in place of the damaged babbitt bearing) but the set ran on regardless of the pounding it took."

Witte 7½ k.v.a. diesel generating unit which operated continuously through Antarctic winter for the Ronne Research Expedition.

Four New Caterpillar Diesels

FOUR new "Caterpillar" diesel engines, each with a bore and stroke of 5¾ x 8 in. and a full load speed range of 800 to 1200 rpm, are tabbed for volume production at the Peoria plant of Caterpillar Tractor Co. before the first of the year.

Of eight-cylinder and 12-cylinder design with a 60 degree "V" arrangement, the newcomers will go into the assembly lines as quickly as the new diesel engine factory is completed at the Peoria plant and will offer users considerably more powerful units than any current production model with the most powerful of the four having a maximum rating of 500 hp.

The engines will be available as industrial power units, electric sets and completely marined engines and augment the present line of six models of engines—the largest of which, the "Caterpillar" diesel D17000, has a maximum output of 190 hp. at 1000 rpm.

The four were recently unveiled to the public by "Caterpillar" along with a diesel engine of 225 hp. at 2000 rpm. governed full load speed integral with the new "Caterpillar" diesel DW21 and DW20 wheel-type Tractors.

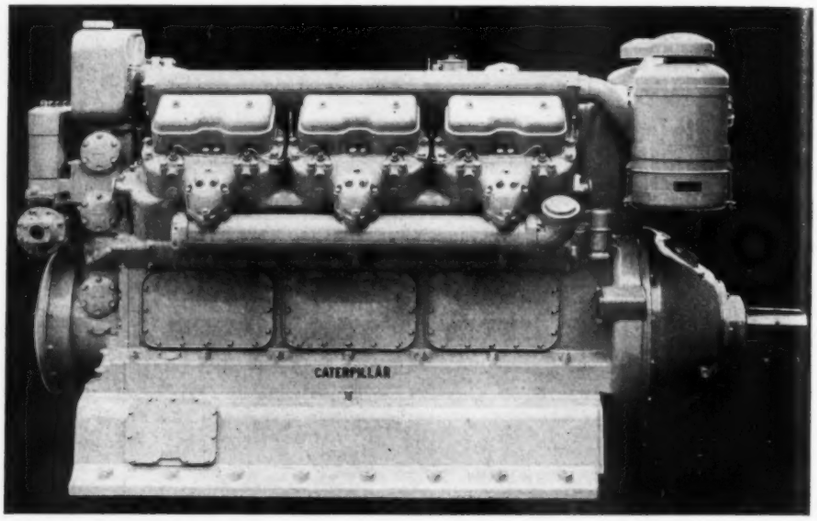
The four stationary power units include: The "Caterpillar" diesel D397 engine, a V12 engine with blower, with a maximum output of 500 hp., a rated output of 430 hp. and a continuous output of 400 hp.

The "Caterpillar" diesel D386 engine, a V12 engine, with a maximum output of 400 hp., a rated output of 360 hp. and a continuous output of 320 hp.

The "Caterpillar" diesel D375 engine, a V8 engine with blower, with a maximum output of 334 hp., a rated output of 300 hp. and a continuous output of 268 hp.

The "Caterpillar" diesel D364, a V8 engine with a maximum output of 267 hp., a rated output of 240 hp. and a continuous output of 214 hp.

The four engines are designed to permit 100% power takeoff at either end of the engine. Interchangeability of parts between engines of like number of cylinders offers additional advantages to users.



The new Caterpillar D 397 diesel with blower, having maximum output of 500 hp. at 1200 rpm., governed full load speed.

All four of the engines have a width of 48¼ in. and a height of 70½ in. The two V8 engines are each 88 5/16 in. long while the 12-cylinder D386 is 108 9/16 in. long and the 12-cylinder D397 is 112½ in. long. The two V8 engines have a piston displacement of 1662 cu. in.: and two V12 engines a piston displacement of 2493 cu. in.

The lubrication system features full pressure lubrication gear type pumps; extra large oil sump with separately housed replaceable by-pass oil filter elements. The full flow of oil to the engine passes through engine mounted metal edge-type strainers. A water cooled oil cooler is standard. The maximum permissible angle of tilt in any direction to maintain proper lubrication is 3 degrees (5%) from horizontal; with scavenge pumps available for greater angles.

A gear-type transfer pump supplies fuel through replaceable absorbent filters to the individual fuel injection pumps with the fuel delivered under pressure to the single orifice fuel injection valves, capsule type. A hand-operated pump permits priming the fuel system before starting the engine.

A built-in, gear-driven centrifugal type circulating pump circulates the coolant. The system has thermostatic water temperature control with an expansion tank standard with connections for use with the heat exchanger and separate outside cooling facilities. When equipped with radiator, the fan may be belt-driven either from the engine or from a separate electric motor.

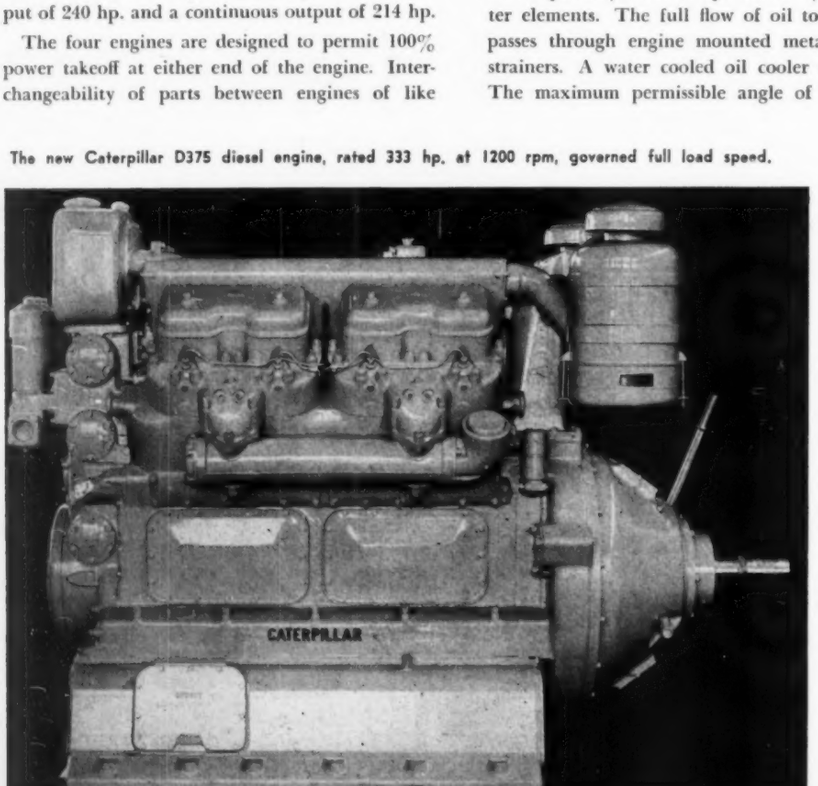
A choice of starting systems is offered—electric or air. The air cleaner is a Donaldson oil bath type with an air stack cap.

The governor is "Caterpillar" built of the fly-ball, spring balanced type, acting through the entire speed range. The standard nominal governor regulation is 10%.

The crankshaft is high carbon steel, drop forged with Hi-Electro hardened journals. High carbon steel connecting rods, drop forged and heat treated are provided with main bearings and crank pin bearings of solid aluminum alloy, precision type and piston pin bushings are of precision bored bronze. Pistons are aluminum alloy of trunk-type design while hollow, full floating carburized and hardened ground piston pins are provided. Three compression rings and two oil rings are also provided.

Specifications call for removable, wet type, Hi-Electro hardened, alloy cast iron cylinder liners chemically treated for superior "break in." The cylinder head is of the water director type, alloy cast iron with removable precombustion chambers. Valves are the in-head type, one intake and one exhaust per cylinder.

The new Caterpillar D375 diesel engine, rated 333 hp. at 1200 rpm, governed full load speed.



SELF PROPELLED CEMENTING EQUIPMENT FOR MARINE DRILLING OPERATIONS

By WM. D. OWSLEY*
and JOE M. JOHNSON**

WITH rapid expansion of the oil industry in all phases, new sources of petroleum have become extremely important. Exploration activities over the past decade have led an unending search for discovery of new fields which have introduced greater depths and higher pressures, thus demanding improved design of drilling and service equipment.

Gulf Coast oil producing areas for several years have been a proving ground for new techniques and practices, for this area presents a bulwark of resistance to even the most modern equipment available today. Great depths, treacherous formations and extreme pressures constitute a supreme test within themselves, but in this area there are other natural environments with which to reckon. The Louisiana coast, with its shallow bays, lakes, lagoons, and canals, is an important oil province. Most of the tidal bodies of water are closed to the Gulf by bars or marshy plains but are connected with it through narrow inlets (passes) or by long and short natural tidal channels. Farther inland vegetation changes from swamp grass to waterlogged jungle. Below these hundreds of square miles of mosquito-infested lowland exist oil and gas formations which extend out into the Gulf itself along the Continental Shelf.

Marine drilling operations have been developed, and today this vast territory is dominated by extensive research in deep well drilling, directly affecting the methods and equipment used in cementing wells in this area. To meet these developments, a new fleet of oil-well servicing boats have been launched. The boat service supplements the conventional practice of transporting land-based cementing units to offshore locations on tow barges. Its development marks the first adaptation to marine operations of handling cement in bulk instead of sacks. Heretofore, the problem of carrying additional equipment on tow barges has prevented utilization of bulk cement advantages at offshore locations.

The unique boat installation provides safer, more convenient handling of equipment as well as more adequate facilities.

Construction of these craft began in November, 1946, near Harvey, Louisiana, across the Mississippi River from New Orleans.

Converted from LCTs, seagoing vessels employed during the war to put tanks ashore, the boats are the first self-propelled craft ever to be outfitted with oil well cementing equipment. Their overall length is 112 feet, beam 32 feet, average draft 3½ feet, making them navigable in nearly all of the numerous waterways traversing the coastal region. Any channel dredged to accommodate a drilling barge will also admit these service craft. The converted LTCs are driven by three screw propellers, each of which is powered by a 165 hp Gray marine diesel engine, a marine conversion of the General Motors 6-71.

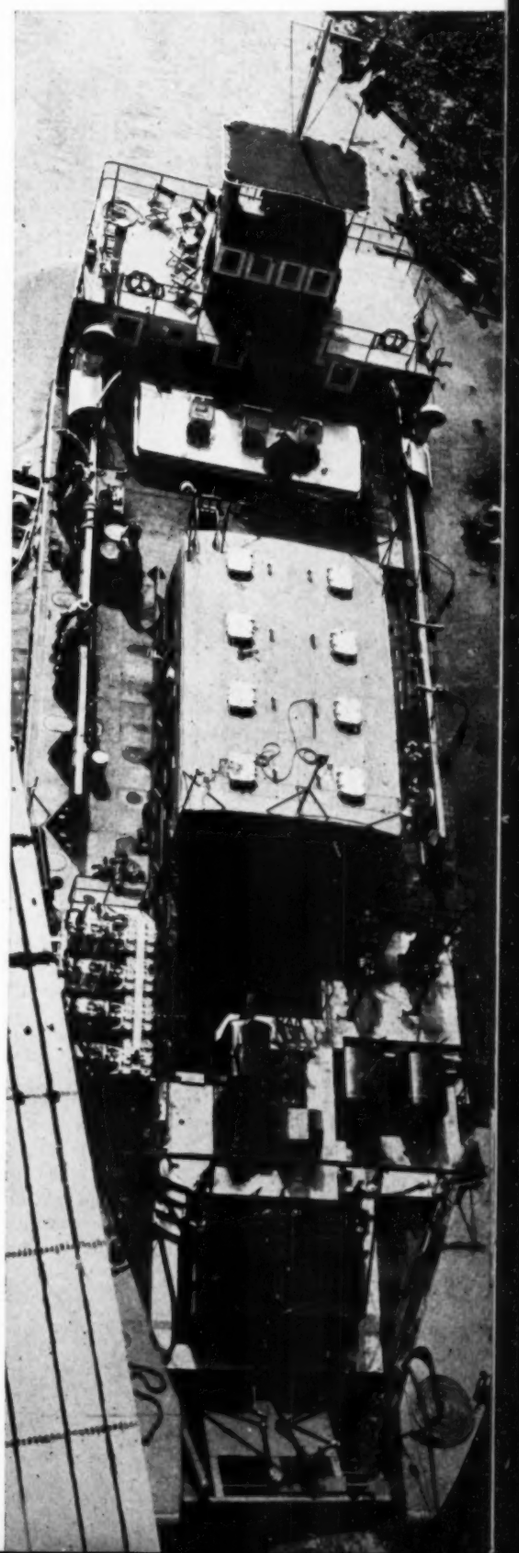
Equipped with both steam and diesel-driven pumps, all permanently mounted, these boats are the equivalent in power of more than three of the standard pump truck cementing units.

Topside installations include pump assemblies and measuring tanks on the bow, bulk cement bins amidships, pilot house and engine control room aft. Below the pilot house are the crew's quarters and directly below are modern kitchens and food storage lockers. A general overall view of equipment installations is shown at the right.

Mounted on the port side of the bow are two power driven cementing pumps capable of delivering in parallel ten barrels of fluid per minute through an open line at zero pounds per square inch.

Recordings have been taken in actual field operations of 64 gallons per minute at 5000 psi. The initial pumps, placed in the field for the first time in 1937, were designed to operate at 6000 psi, but the improved versions now attain pressures up to 8800 psi.

Each pump is driven by a General Motors 4-71 diesel engine equipped with 70 mm injectors to deliver 123 hp at 1800 revolutions per minute. Power is transmitted into the pump gear shaft through a torque converter and a five-speed



Cement boat from derrick monkey board. Cementing pumps and mixing equipment are forward. Amidships are eight 250-sack bulk cement storage bins. →

* Technical Advisor, Halliburton Oil Well Cementing Co.
** Engineer, Halliburton Oil Well Cementing Co.

Typical drilling location in the Louisiana swamps w dredged revetment for rig.

transmission. The torque converter is so arranged that power can be transmitted either by tydraulic torque conversion drive or by direct engine drive, which aids in tapping maximum horsepower at any desired pressure. A cushion within itself, the torque converter eliminates shock load and supplies smoother, safer operation with longer life efficiency. These power pumps may be compounded where long periods of pumping demand abnormally high pressures, or they may function singly or in parallel through a common discharge line.

A horizontal, duplex, power-driven pump is located near the center and forward on the bow and just ahead of a 40-barrel measuring tank. A power pump capable of attaining pressures up to 4000 psi, its primary purpose for marine service is to supply water to the hydraulic mixer. The unit is designed for compactness and interchangeability on land-operated installations and is powered by the same type engine as that used on the vertical power pumps. Power is transmitted through a four-speed transmission and a right-angle drive. This pumping unit is the work horse of the fleet. Aside from routine mixing duties, it supplies water pressure for washing down and cleaning the entire craft after each job is completed.

Manifolding for the mixer pump is so arranged that water may be drawn from the bayou and displaced into the measuring tank or into the mixer, but ordinarily during cement mixing operations, water is drawn exclusively from the measuring tank. In this manner a double check can be made on the quantity of bulk cement being consumed.

On the starboard side of the bow are four 12 x 4 x 12 steam pumps, used in connection with steam operated drilling rigs. This battery of pumps is capable of mixing and pumping cement slurry into a well at a rate in excess of 40 sacks per minute. With two of the pumps running in parallel, the unit can handle fluid at the rate of 480 barrels per hour. The four can be compounded in line to operate above 9000 psi with 300 psi steam pressure. The entire manifold is so arranged for utmost flexibility to meet both normal and abnormal service conditions. Pumps may be operated individually, in parallel, or in compound as may be required.

Delivery of cement to the hopper during mixing operations is completely mechanical, screw conveyors being employed to feed the mixing bowl from the two V-bottom bins installed in the middle of the boat. Release of the cement into the conveyor channels is controlled by hydraulically operated baffllles in each of the eight 250-sack compartments. The baffle mechanism holds cement off the screws until ready for use and thus keeps it from packing in the conveyor tubes.

Directly aft of the measuring tank lies a centrally located remote control station. Mounted on a walkway covering a network of manifolding, this station, a nucleus about which all operations revolve, commands fingertip control of all units. The control panel proper contains engine temperature and oil pressure gages, torque converter temperature and oil pressure gages and tachometers. Here also are the clutch controls, throttle levers and start and stop buttons. All throttles and clutches are hydraulically controlled. Engine governor start and stop devices are electrically actuated by solenoids. The only direct mechanically connected controls are the transmission gear shifts. All valves on tank manifolds are conveniently arranged for speedy manipulation. Mixing operations are centered directly in front and below the remote station for clear vision by the operator. From this point he can direct all activities which include the cement storage baffle positions, rate of flow of cement from conveyors, slurry weight, pump speeds, fluid measurement, applied pressures and rig floor observations.

Other equipment on deck includes a large vise and bench for repair work, lubricant storage, converter fluid storage and davits for lowering and lifting from the side a 12-foot, aluminum run-about boat, equipped with 3½ hp outboard motor. Storage compartments forward on port and starboard sides contain spare parts, cementing plugs, tools and miscellaneous pipe fittings.

Simplified manifolding throughout this project has been the keynote for quick processing on any type of job. Discharge lines from either the steam pump or power-driven pump stations are channeled into a single three-inch discharge line. This line is mounted in boom fashion on the extreme bow point with the anchored end coupled to pump stations through flexible knuckle joints which facilitates a pivoting action from port to starboard, depending on rig accessibility. A winch assembly lifts the three-inch joint to the rig floor level where it is secured for service connection to squeeze manifolding or a casing head quick change as may be required.

This highly mechanized boat is the answer to years of planning by cementing crews and oil field operators. History records the service crews' battle against the elements. A slogan originated, encouraging the oil operators with its challenging determination to "Get there somehow." So today they do "get there somehow," but it is only the skipper's routine assignment. The cook prepares those three squares a day, and at job time the engineer boasts, "Everything's shipshape!" The cementing crews are standing by—their connections are made and on a signal from the rig floor it's "Man the baffles, throttle the screws. . . . " A successful cementing job is underway on the water.

Offshore operations in open Gulf waters demand still another type of cementing unit. Drilling facilities in that area are paramount in size and proportion to land and intracoastal equipment. Designed to cope with high seas and destructive swells, an auxiliary boat which couples to a derrick floor, "V" door side direct, has been employed on one project observed. This boat contains all essential equipment and supplies for operation exclusive of the draw-works proper.

A survey was made among oil company representatives to study various needs of an anticipated cementing unit. A portable installation was emphasized, suggesting power-driven equipment and stressing compactness and minimum weight but yet incorporating all techniques of a proven cementing system. Overall dimensions are critical due to varying sizes of hatch openings in the

Converted LCT, tank landing craft, first self-propelled vessel to be outfitted for cementing. Pilothouse and crew quarters are aft.

Portside view of craft anchored alongside a rig waiting the "go ahead" signal →

weather decks. In some instances, installations of cementing units would be made on the second floor level amidships where utilization of floor space is an essential factor.

Components of the initial assembly were first mounted on one skid, structurally stressed for its static load as well as abusive loads in transit; however, the excessive weight involved and questionable loading facilities prompted an immediate change. Improved versions employ two mating sections which can be easily separated for shipment or flanged together on rig installations. One section consists of a standard skid mounted, power-driven, vertical cementing pumps, similar to that being used on the service boats. The mating skid consists of a horizontal duplex water pump arrangement, aso similar to the unit previously described, and a 20-barrel fluid measuring tank. Manifolding is restricted to the bare essentials, but is arranged for convenient valve manipulation. Elevated walkways, centrally located controls and compactness are a few of the finer points employed in this unit.

Total weight is 23,000 pounds with overall dimensions reading 14 feet 7½ inches x 10 feet 9½ inches. This unit is the equivalent of a standard land-based truck unit. Such units are operated and maintained by the cementing company's land-based crews who are transported to the drilling operation by speed boat when they are needed.

1 FIRST PASSENGER DIESEL FOR BRITAIN

By J. H. M. SYKES

The first Main Line diesel electric locomotive on British Railways. Hauling a passenger train at speed.

BRITISH railroads have been under National control since January 1st, 1948. Before that date one of the leading companies, the London Midland & Scottish Railway Company had completed the first experimental main line diesel-electric locomotive in Great Britain. It was shown to the Press at the Railroad's main terminal, Euston Station, London, on December 18th, 1947.

The unit, numbered 10,000, is the first of two to be coupled together for hauling the heavy trains on the former L.M.S. system from London to Glasgow, 420 miles north. This run is noted for its heavy traffic conditions, its severe grades, and the high speeds which are traditionally expected over a much-used journey linking two important cities.

The diesel-electric principle has been employed on British railroads before, and shunting locomotives, powered by diesels of average horsepower of 350, have been in successful service for many years, over 100 of them having operated in the switching yards in all parts of Great Britain.

The first passenger unit presents a sleek appearance being finished in black with a silver band, and with a streamlined driving cab at each end. It is 61 ft. 2 in. long, and weighs, in working order, 284,500 lbs. The maximum tractive effort is 41,400 lbs. and a speed, with full load, of 100 miles an hour can be obtained under suitable conditions.

The power plant and electrical equipment have been supplied by The English Electric Company. The engine is of V design, and comprises 16 cylinders each with 10 in. bore and 12 in. stroke. Its rating in this application is 1,600 bhp., at 750 rpm., but it can develop 1,760 hp. for traction purposes. Individual fuel pumps are fitted, operated through roller followers from two high-level camshafts arranged in outboard fashion along each bank of cylinders. The cylinder jackets and crankcase are of Monobloc construction. The bedplate is a single casting of special iron, and is extended at the flywheel end to form a facing to which the generator body is bolted and registered. The 8-throw crankshaft is machined from a single bloom of high-grade steel without twisting. The drive to the lubricating oil, water and fuel transfer pumps comes from the free end of the crankshaft. Two water pumps and two lubricating oil pumps are fitted. The governor which controls the engine at all speeds is mounted at the flywheel end, and is driven from one of the camshafts. It regulates the fuel pumps by means of a piston operating from the lubricating oil system.

Four exhaust gas turbo chargers of British Brown-Boveri manufacture are fitted, each serving four cylinders. The turbo chargers have self-contained automatic lubricating systems which are entirely independent of the engine system. The engine is started by motoring the main generator from the batteries. Radiators are provided in each body side, with both oil and water cooling elements. There is thermostatic control on the waterside of the radiator.

The main fuel tanks are placed across the locomotive, while the service tank is fabricated into this structure above the main tank. There is a central passageway through the main fuel tank in order to give access throughout the locomotive. At one end of the engine room, a bulkhead is provided, with airtight doors, in order to provide a clean air cmpartment to house the main electrical equipment cubicle. The main and auxiliary generators project into this compartment, from which

they draw their air supply.

The main generator is a single bearing machine, directly coupled to the engine crankshaft. It is of the direct current self-ventilated type, and has two separately excited field windings and a series decompounding winding, which has another application when the generator is motored from the battery for engine starting purposes.

The six angle-hung nose-suspended traction motors, which drive through single reduction spur gearing, are of the series-wound reversible forced-ventilated type. The armature bearings are of roller-bearing pattern, arranged for grease lubrication. The pinons are of nickel-steel, case-hardened and ground steel, while the gear wheels are of carbon chrome steel.

The electrical control equipment consists of electro-magnetic and electro-pneumatic contactors, and is mounted in a single dust-tight main control frame. The driving controls comprise a master controller having sixteen notches, while there is also a reverser lever and a master-switch for starting and stopping the diesel engine. The driver has full control of the locomotive speed and power in a single main control handle, while a deadman's pedal is fitted, with a four-second time delay, to allow the driver to change his position. Two or more locomotives may be coupled together and operated from one driving cab. A set of instruments in the engine room and control equipment compartment enables the condition of the engine, and of the electrical circuits, to be checked at any time.

The auxiliary equipment consists of an auxiliary generator, two traction motor blowers, and the radiator fan motor. The auxiliary generator is overhung on the main generator, and supplies current for the control circuits, for battery charging, for operating the motor-driven compressors, exhausters and traction motor blowers, and for locomotive lighting. The traction motor blowers are motor-driven fans of the centrifugal type, each blower supplying the cooling air for the three traction motors mounted on each bogie. The radiator fan is driven by a vertical spindle motor which takes current from the main generator. The speed of the fan motor is controlled by relays and thermostats to ensure that the temperature of the engine cooling water and oil is kept within the desired limits. The motor itself is of the totally-enclosed type and is cooled by the passage of air over the motor carcase.

A separate compartment in the locomotive also houses a Clarkson Thimble Tube Boiler for steam used in train heating. This boiler operates from oil fuel. There is also a lavatory in this compartment.

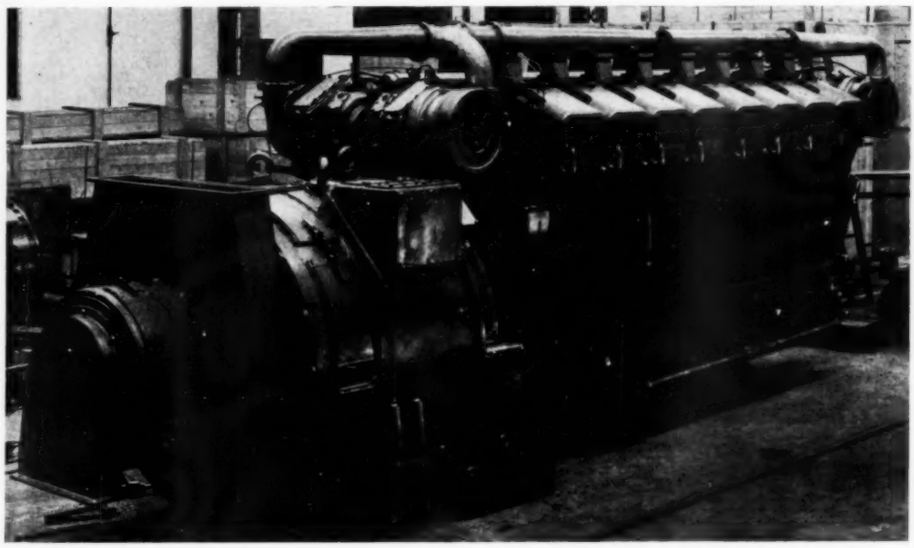
The driver's cab at each end is provided with adjustable cushion seats, while the fittings include the main controller, the brake valve, windscreen wipers with an arrangement for washing windows, and sanding and horn valves. De-frosters and sunblinds are fitted, with two electric heaters alongside each seat. The dashboard, with a nest of instruments, is equipped with indirect lighting. There is also a hand-brake wheel.

The six-wheel bogies are built up from fabricated assemblies and are of novel design. It was considered essential for good riding to adopt the bolster type, and in the usual layout, the two bolsters are coupled together by a member of stiff section, which transfers the full weight of the main frame and body from the centre pivot. With such a design it is not possible to find room for a traction motor on the centre axle. As in this case it was decided that three motors per bogie were necessary, the present somewhat unique design was adopted in which the weight is carried on the axes of the bolsters themselves at four points through sliding surfaces, the centre pivot only requiring to deal with location and traction forces. The connecting member joining centre pivot to bolsters can thus be made of much lighter section, and it is possible to obtain sufficient clearances for a motor to be mounted on the centre axle.

The principal particulars of this locomotive are:

Type of Locomotive	0-6-6-0
Diesel Engine: Type	16 S. V. T. English Electric Co.
Continuous rating	1,600 h.p.
No. of Cylinders	16
Dimensions of Cylinders	10" bore x 12" stroke
Max. Engine Revolutions	750 r.p.m.
Tractive Effort (max.)	41,400 lb.
Tractive Effort (continuous rating)	15,000 lb.
Length over Buffers	61 ft. 2 in.
Weight in Working Order	127 tons
Engine Fuel Capacity, Main Tank	815 gallons
Engine Fuel Capacity, Service Tank	85 gallons
Carriage Warming Boiler Fuel Tank Capacity	130 gallons
Carriage Warming Boiler Water Tank Capacity	595 gallons

The locomotive is performing regular duty, while it awaits the second unit before going on the London-Glasgow run. During this period it has equalled—and frequently excelled—the performance given by the equivalent steam locomotive, carrying train loads of 390 to 400 tons on the route between London and Derby, a journey of some 130 miles, including some severe grades. It has so far reached speeds of well over 80 miles an hour whenever required.



The 1600 hp. 'V' type power unit, designed and constructed by The English Electric Company, used in locomotive.

L.M.S. Main Line diesel electric locomotive No. 10,000. Motor Bogies and centre portion of cab in position.

A Caterpillar diesel tractor with bulldozer breaking over the top at Glendale, California reservoir job.

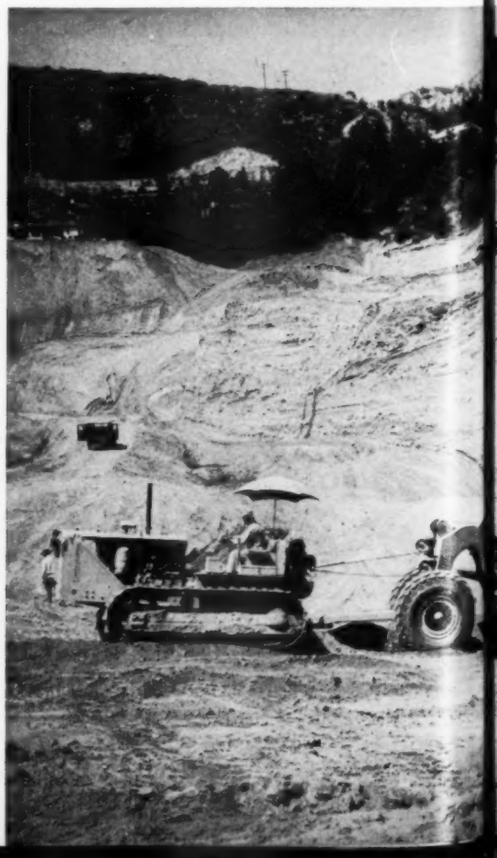
Diesel tractor-carryall combinations moving earth from pit to

LEAPING CATS DIG RESERVOIR

Moving Cubic Y

Four Caterpillar tractors busy scraping, leveling off and carrying away earth.

Equipment seen here is moving 420,000 cubic yards of earth 57 million gall



th from pit to

By FRED M. BURT

Moving Cubic Yards Over 17% Grades

ards of earth 57 million gallon reservoir.

THE construction of the new Glendale, California city reservoir, at the base of the foothills, involves a difficult earth moving job. This is because the entire area of the project is but 11 acres, while the reservoir proper will cover approximately six acres.

The reservoir will be a 600 ft. x 650 ft. concrete rectangle having an average depth of 30 ft; with three perpendicular sides, sloping on the lower side. It will have a capacity of 57,000,000 gallons of water, or 171 acre feet, when filled to an average depth of 28½ ft.

Within this comparatively restricted space about 420,000 cubic yards of earth (decomposed granite with some silt), is being moved over steep grades and difficult terrain. To prepare the site for pouring concrete, 200,000 cubic yards of earth is being taken out, moved to elevated work piles, then relocated back in, with an additional 20,000 yards being worked in the main reservoir area. This large movement of earth within such a restricted area requires the earth moving equipment to work continuously up and down abnormal grades.

The major portion of the excavating is taking place at the confluence of two small canyons, with the tractors and scrapers moving up out of the pit on 12% to 17% grades, circling the upper edge of chasm, spreading their loads, then crawling down grades ranging up to 40%.

The earth moving job was started on May 3, 1948 by the Calowell Company of Long Beach, California, as sub-contractors, with Bill Gonyo as Superintendent and Dick Robinson as Consulting Engineer. While at the start some other powered, earth moving equipment was used, within a month it was found advisable to settle on the exclusive use of the eight "Caterpillar" D8 Diesel tractors as power equipment, to do the job in the most efficient manner.

For dirt movement, bull-dozer blades are attached to the front of the cats, or they pull heavy loads carried in six carryalls—two "Caterpillar" 80's built up to 23.4 yards capacity, and four FP, 18 yard Le Tourneaus. The earth is losened up with a K-30 Le Tourneau Rooter.

At an early stage, the earth moving uncovered a small stream on the north, or upper, end of the site. To handle this water and other seepage, after excavations up to 82 feet in depth, on the solid foundation of a "French drain" fill, 12 open pipe lines were cradled in concrete. These lead to a deep inspection chamber located outside the reservoir proper area, on the lower side, from where the water is pumped away as required.

Above this drainage in the pit, earth is spread in six inch fills, and compacted with diesel tractor drawn tampers. There are two of these double-drum units built to Calowell specifications by Kay-Brunner Steel Products, Inc. Of the oscillating type, with the two 54 in. diameter x 5 foot long drums, end-to-end on a common axis, and the other unit in tandem behind, the drums conform to the surface for a complete overall tamping. Each drum weighs 7500 lbs. empty; 10,500 lbs. full of water.

Earth moving teams of men and machines are making some remarkable records. Working ten hours per day, each tractor-scraper combinaation makes as many as 67 to 80 trips per day—or as high as eight trips per hour. The traveling distance on these trips runs up to 2100 feet, and each trip takes from three to nine minutes, with an average time spent of four and one-half to five minutes in completing a circuit.

With very little level or under 10% grade work, load-trips up to 17% grade, and return trips up to 40%, the "Caterpillar" diesel equipment is maintaining a universally high degree of efficiency. A typical work sheet covering about two weeks of diesel tractor operation shows an average of slightly over 58 minutes of effective operation for each 60 minutes of work-day. With no breakdowns or overhauls, practically all time lost has been due to cable changes or breaks.

Diesel fuel consumption per tractor, in this severe operation, averages about 5.8 gallons per hour, as compared with previous 4.4 to 4.5 gallons per hour consumptions on level work of similar character.

The average depth of the reservoir hole will be approximately 45 feet at the start of the tamping. After tamping is completed, forms will be laid and concrete poured. At completion, the reservoir in reality will be a subterranean concrete box, with a floor eight inches thick, and sides that will taper to 24 inches of thickness at the top. A concrete slab will cover the reservoir.

The plans for the reservoir were prepared under direction of P. Diederich, general manager and chief engineer of the Glendale Public Service Department. W. C. Reisner, design engineer, supervised the detailed planning of the entire project.

Right: Equipment for the new Fulton Diesel includes Honan-Crane lube refiner, upper left, and Ross jacket water cooler, right.

Below, right: Side by side, extreme left are American air filter and Burgess exhaust snubber. Home made cooling tower right.

Far, right: Generator end of the new 1170 hp., 8-cylinder Fulton Diesel. Generator and exciter are Burke.

LOUISIANA BAYOU TOWN

30 years with Diesels

By WILL H. FULLERTON

FRANKLIN, Louisiana, is another of those fine little cities of Bayou Teche, with a history going back to the earliest days of Louisiana, and with a scenic back-drop of mighty moss-draped live oaks extending for miles along this ancient waterway up which Evangeline made her way.

Franklin is not a big city; never was and never will be; the surroundings are agricultural and there is little in the way of the kind of industry that builds population. Here, in 1940 the population was around 5,000; during the war, there was considerable increase as the marine construction in Morgan City flooded the whole area with the need for housing for skilled labor. So Franklin grew, and some of this growth has been permanent; which implies the need for more electric current.

Though small and no commercial center, this city always has been progressive, and probably was one of the first of Louisiana's smaller cities to have its own municipal power plant.

In 1889 the city built its first plant, which was the waterworks; a year later, the light plant was added to the facilities, with a steam engine turning the generator. This modest plant furnished light and power for Franklin and the surrounding rural area until 1916 when the city fathers decided to modernize. At this time they decided on Diesel power and installed a pair of Busch-Sulzer engines, of 120 hp. each at 300 rpm., each turning an 80 kw. generator.

These were air-injection engines and the installation date was over thirty years ago; nevertheless these power plants are still in working order and in fact were used during the past summer during the peak load for lights and electric fans.

Gradual increase of population, plus gradual increase in wages and improvement of living standards alike in city home and farm, brought added electric demand, and in 1922 another Busch-Sulzer, of 250 hp. with a 170 kw. generator was added.

In 1927 a fourth Busch-Sulzer was installed, this one of 400 hp. with a 270 kw. generator. The demand for current still showed increase and in 1940 a big 750 hp. Busch-Sulzer was added, a 257 rpm. engine turning a 525 kw. generator. This made a total of five Diesels of the same make and then the war came along with its stepped-up demand for everything and Franklin needed still more electricity. And with the war's end, the local population had received enough of a permanent increase so that Franklin's added demand for current appeared to be permanent and the city looked around for another Diesel.

"Please understand," says I. W. Ibert, plant engineer, "that we had no complaint against our Busch-Sulzer engines. They have given us wonderful service and we would have been glad to continue with our standardization. But the need for more power just wouldn't wait and we had to have an immediate delivery. So we threw it wide open to everybody and asked for bids, and bought the job which provided us with the required power at the best delivery date. It's a Fulton Diesel, and I must say we're very well pleased with it."

Yes, it really is a beautiful job, and the installation—by Fulton engineers incidentally—is a neat piece of work. The city had to build an addition to its plant to house the new engine, adding forty feet onto the length which allows room for still another engine if necessary.

While all of the other engines could be operated, the city is getting a lot of work out of this new machine and frequently it supplies the community's entire electrical need all by itself. The engine is an 8 cylinder model, with cylinders 17½ in. by 24½ in., and develops 1170 hp. at 257 rpm., turning an 800 kw. generator.

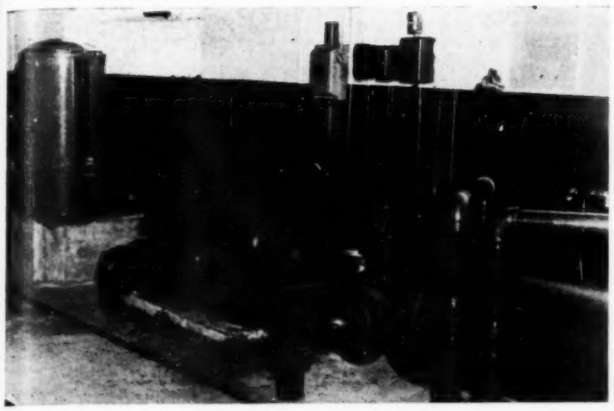
Fuel injection is mechanical, of Fulton design and make. A Brown pyrometer system is built-in, with thermocouples for each cylinder. A Honan-Crane refiner is installed for lube oil protection. Cuno lube and fuel filters are factory equipment, and the plant has put in no further fuel oil filtering system.

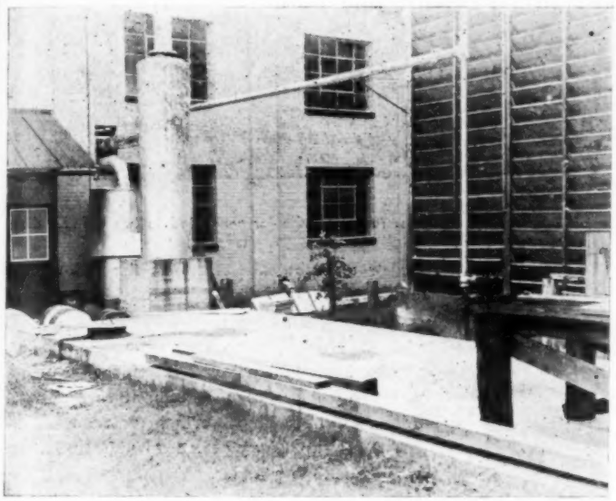
A Manzel lubricator is mounted on the front of the engine, near the engineer's station. The governor is a Pickering, and the automatic alarm system is a Penn. This alarm sounds a whistle but does not stop the engine, and operates only in case of lube failure. Mr. Ibert states that he is going to put in a further alarm on the cooling system. Which system, by the way, includes an outside cooling tower built by the city, a Ross heat exchanger, and a Wyman pump powered by a 10 hp. Burke electric motor. A Burgess snubber quiets the exhaust, and intake air is cleaned by a "Cycoil" American air filter, bought along with the engine.

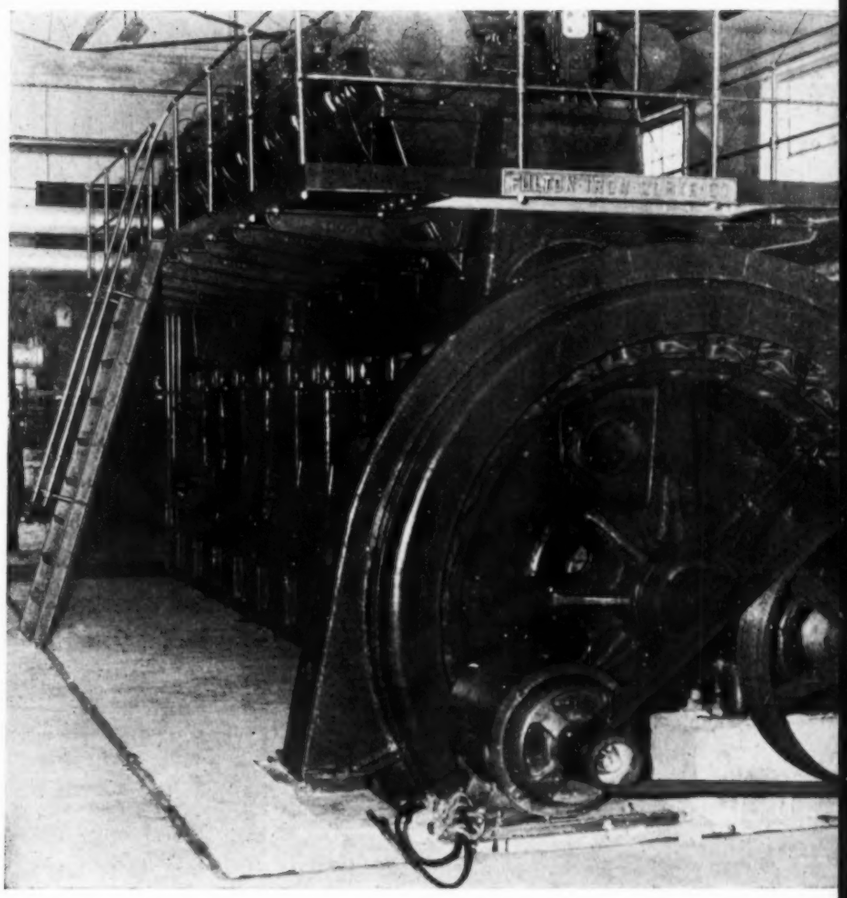
The generator attached to the new engine is a product of the Burke Electric Co., Erie, Pa. This is 1000 kva., 275 rpm., 2400 volts, 241 amperes, 60 cycle, 3-phase. The exciter is also a Burke, of 20 kw., V-belted to the generator shaft.

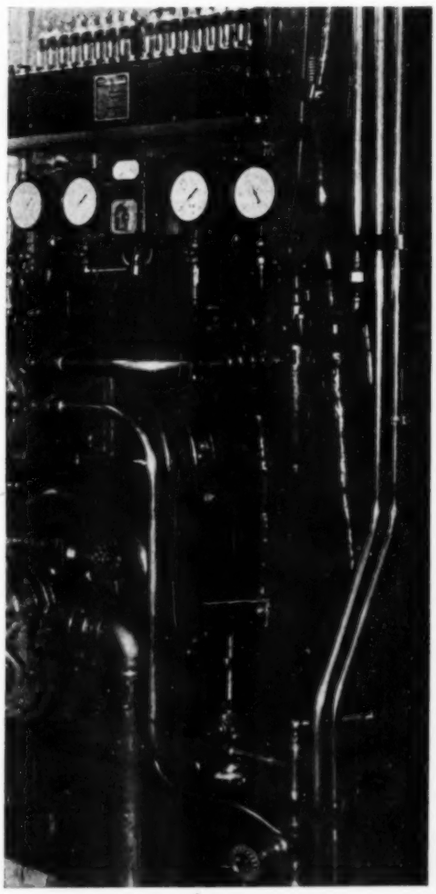
Starting of the Fulton is by air, supplied by Curtis and Fairbanks-Morse compressors. Weight of the Fulton and generator is 195,000 lbs., complete. Lube oil used is Standard, Teresso, SAE 30.

No tests for fuel consumption have as yet been









run on the new engine, as the plant engineer believes in giving an engine a break and having it thoroughly broken in and in perfect adjustment before asking it to perform for the record. However, says Mr. Ibert, the fuel consumption for the entire plant, year in and year out, averages one gallon for each 12 kilowatts of current produced, and from casual observation so far, the Fulton is going to come well within this plant average.

More plant improvement is planned. For one thing, part of the city's service is 2-phase, part 3-phase. The latest generator is 3-phase, the older ones 2-phase. Transformers are used to change the current from 2 to 3 and 3 to 2. Kind of confusing, but as Mr. Ibert says, when you tried to expand during the war you took what you could get and asked no questions. The plan is for the entire plant to be 3-phase; a new General Electric 3-phase switchboard is being installed; the old board, a 2-phase, is also General Electric.

As mentioned, the addition to the plant was made large enough to accommodate another big engine, the need for which Mr. Ibert can foresee, and which—when as and if bought—may be a supercharged model.

"When we bought this Fulton," says Mr. Ibert, "the idea of supercharging interested me; it means more power for less plant space and less cost to the taxpayers. But I didn't think that supercharging had quite proved itself; if it were my own money I was spending, that would be different. But I felt that my fellow taxpayers ought to have machinery about which there could be no doubt, so we didn't buy a supercharged engine. Supercharging really is proving itself nowadays, however, and when we again increase our electricity output, we are going to look into supercharging very carefully."

There seems to be a good chance that the taxpayers of Franklin will have a supercharged Diesel soon.

Front end of the Fulton engine showing Manzel lubricator, Brown pyrometer, Penn alarm switch and Cuno fuel filter.

Pressure Indicator for High Speed Diesels

By H. RUTISHAUSER and A. TACCHELLA

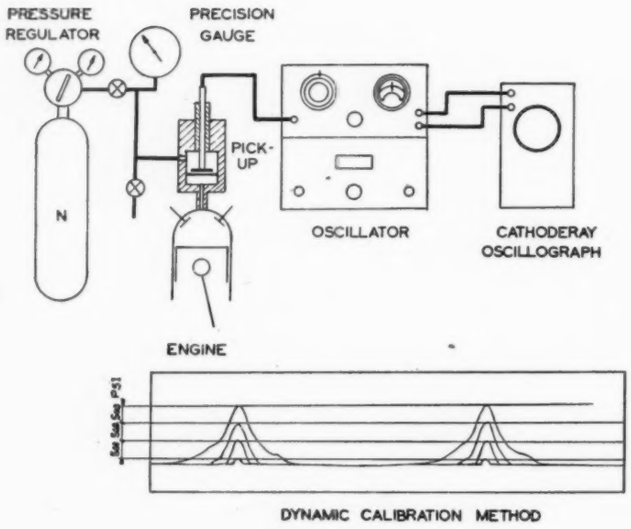
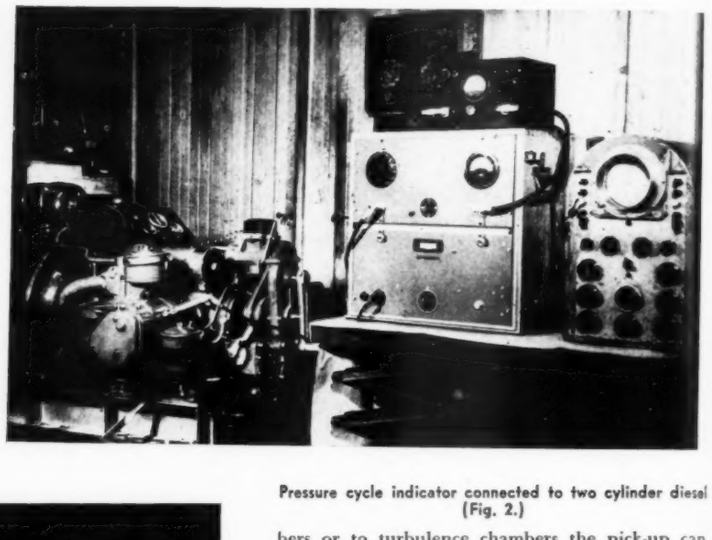


Fig. 1. Diagram showing Rutishauser pressure cycle indicator with dynamic calibration pressure curves.



Pressure cycle indicator connected to two cylinder diesel (Fig. 2.)

Fig. 3. Pressure-time diagram of diesel at 600 rpm. idling speed.

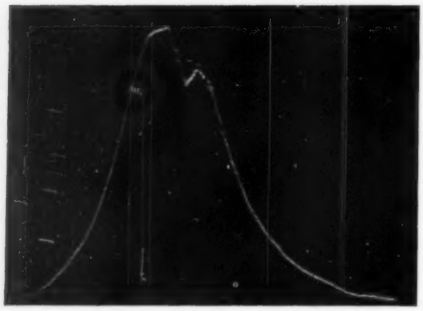


Fig. 4. Diesel pressure-time diagram taken at 1800 rpm, 80% load.

THE rapid development of thermal engines including jet motors demands entirely new instruments for the solution of many problems confronting the research engineer.

New combustion phenomena encountered in these fields were concealed to a great extent for lack of a high speed pressure indicator. Months if not years of expensive development work could have been saved had such an instrument been available.

The Rutishauser pressure cycle indicator will give the research engineer an accurate picture and record of the pressure cycle in sharp and true definition down to pressure transients of one micro second.

After several years of development work on this indicator it has become a most reliable instrument. The standard model embodies the latest electronic advancements. It has a linear pressure voltage translation from constant pressure up to one megacycle pressure transient. The pick-up functions as a variable condensor and consists of a diaphragm of thickness and diameter suitable to the pressure range to be indicated, and an insulated stator

The diaphragm deflects under the pressure load and in relation with it and consequently causes an immediate increase or decrease in capacity between it and the stator.

This capacity change is reflected into an electronic oscillator, effecting a frequency change. The applied pressure will therefore modulate the fundamental carrier frequency. Pick-up temperatures can reach 600 degrees F without any damage to the instrument or loss in accuracy, consequently no special cooling of the pick-up is required. The output voltage of the oscillator is sufficient to directly drive a cathode-ray oscillograph.

Besides a static, a novel dynamic calibration is introduced which eliminates any possible error caused from any change in temperature of the pick-up.

An electronic calibrator will clip any negative part of the diagram and by applying a gauged balancing pressure on the opposite side of the diaphragm the diagram will submerge into the zero line proportionally to the applied calibration pressure as shown in Fig. 1.

For its application to engine combustion chambers or to turbulence chambers the pick-up can be furnished with ¼ in. standard pipe thread or ⅜ in. national fine thread.

Fig. 2 shows the instrument connected to a 2 cylinder horizontal opposed diesel engine of 3⅝ in. bore by 4 in. stroke, 15 bhp. at 1800 rpm., at the Standard Machine Works in Pasadena.

The pick-up is connected to the turbulence chamber of one cylinder.

Fig. 3 is a pressure time diagram at 600 rpm. idling speed.

Fig. 4 is taken at 1800 rpm. and 80% load.

These photographs were taken directly of the cathode-ray oscillograph screen with a Leica camera, stop f 2 and ⅛ and ¼ second exposure.

It must be apparent that this electronic indicator should be extremely useful for fuel research, detonation investigation on the CFR engine and particularly on the new Rutishauser fuel combustion tester.

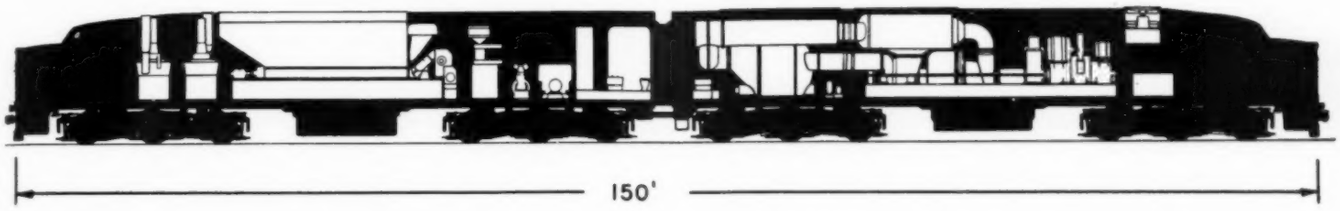
The simplicity of operating this indicator extends its field not only to research but to everyday operating problems.

In large multi-cylinder plants it would give the engineer a quick and accurate check on the combustion pressure cycle in each cylinder, and this together with the exhaust temperature reading from his pyrometer, complete information of the combustion process.

In such installations it would be necessary to have a pick-up permanently in each cylinder. From each pick-up a cable would lead to a selector switch, and from these a cable to an engine selector switch.

The oscillator and cathode-ray oscillograph could be located in the engineers office be it a marine or stationary installation. To thus readily observe the exact pressure conditions for each cylinder enables the engineer to know if there are any life-shortening hammerblows on pistons, bearings and rings. The split second in which combustion takes place is one of the most important moments in the life of a diesel engine.

GAS TURBINE LOCOMOTIVE CONSTRUCTION



Proposed arrangement of power plant and fuel storage for Allis-Chalmers—Alco Locomotive.

FIRST detailed description on the construction of the locomotive gas turbine power plant being built by Allis-Chalmers was presented recently by W. B. Tucker, of the company's turbo-power development department, in a paper presented at the recent Semi-Annual Meeting of the American Society of Mechanical Engineers.

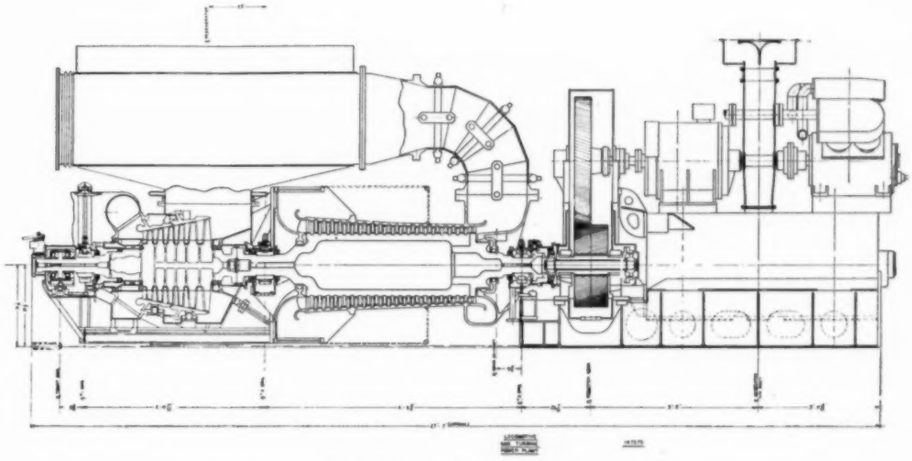
Now under construction in Allis-Chalmers' West Allis Works under contract with the Locomotive Development Committee of Bituminous Coal Research, Inc., the unit will be part of a locomotive which is expected to be of major importance to our national economy for several reasons: the expected fuel costs will be considerably less than those of diesel or steam reciprocating locomotives, the required maintenance is expected to be less than for present types of locomotive power, and the ability of this locomotive to burn ordinary grades of railroad coal will make it a particularly valuable prime mover under conditions, such as war, when liquid fuels will be in very short supply.

Design of the locomotive power plant, according to Mr. Tucker, was based on the following major considerations: operation at high efficiency with low cost fuel, high availability for service, weight within limits of desired axle loading without complicated truck arrangement, adaptability to quantity production, low maintenance cost, and simplicity of control.

The gas turbine plant will operate on the open cycle with regeneration, and is designed for an initial gas temperature of 1300 F. and a pressure ratio of 4.8. The total pressure drop through the combustor and fly-ash separator has been taken at 2.8 psi. and combustion efficiency at 96 per cent. With these conditions and with ambient air conditions of 70 F and 14.7 psia, the unit will deliver 4120 horsepower to the reduction gear pinion with 24 per cent shaft thermal efficiency.

The unit will work equally well with fuel oil, which will be used during occasional short periods, such as when starting. If the unit is installed for use with fuel oil only, a higher efficiency will be realized, because of the elimination of the pressure drop in the ash separator.

Considerable care has been taken to design a mounting for the turbine, compressor, regenerator, reduction gear, and generators, so that good operation of the unit will continue without being influenced by the frame distortion as the locomotive moves over the track. In order to axially balance the pressure forces on the rotating elements of the turbine and compressor, the spindle and rotor are connected by a stiff coupling. These units are so mounted on the cab frame that deflection in the frame will not disturb the alignment.



Cross section drawing of gas turbine.

Change of alignment between the compressor shaft and the reduction gear is taken care of by a flexible arrangement similar to that which has been long used in marine turbine construction.

The prime mover element is a six-stage reaction turbine designed to deliver about 12,200 horsepower to the turbine compressor coupling at a speed of 5,700 rpm. when the inlet gas temperature is 1300 F. and the compressor air inlet conditions are 70 F. and 14.7 psia.

The turbine spindle body is a fabricated construction consisting of six equal diameter disc forgings which are welded together and machined to form the blade carrying portion of the spindle. Stub ends are welded to each of the end discs to form the bearing and coupling ends of the spindle. This type of spindle has been successfully used in many types of gas and steam turbines. The material of the discs and the stub ends exposed to high temperatures is Allegheny-Ludlum S-590, selected primarily because of its physical properties at temperatures of 1300 F. and higher. Supersonic inspection of the metal before and after forging has been used, and the integrity of the disc welds will be checked by radiographic inspection.

Serrated axial grooves across the circumferential faces of the discs are machined to receive the roots of the turbine spindle blades.

Two cylinder rings will carry the stationary blades in machined grooves. These rings are located concentric with the shaft by an arrangement of radial dowels which permit differential expansion to take place without disturbing the relative position of the cylinder rings to the spindle. The cylinder casings and cylinder rings are split on the horizontal centerline to make internal parts more readily accessible.

The turbine blades will be of S-590 alloy steel, the first four rows being precision cast and the remaining two rows being forged. The roots of the blades will be machined to fit in the grooves of the spindle discs and cylinder rings.

All blades are warped and tapered to a considerable degree and are sufficiently stiff so that bracing wires and shrouding are not required. The blade tips are sharpened to reduce the effect of an accidental blade rub.

The turbine high pressure gland is designed to have cooling as well as sealing functions. Air for sealing is taken from the compressor discharge, where it is at a higher pressure and lower temperature than the turbine inlet because it has not yet passed through the regenerator and combustion system. A portion of this air is allowed to flow through the labyrinth packing at the first stationary row of blades and a further amount of the air flows through the gland labyrinth along the surface of the spindle. These arrangements thus provide for cooling of the parts of the spindle which are in the area of highest gas temperatures.

Compressor air is also used for sealing at the low pressure gland.

The axial flow compressor is placed between the turbine and the main reduction gear.

The compressor rotor body is made from a single forging, with the high-pressure stub end integral. The stub end at the low pressure end is forged separately and bolted to the rotor. The com-

pressor blades are inserted in circumferential grooves machined on the rotor body.

The upper and lower halves of the compressor casing are fabricated from shaped steel plates, and circumferentially grooved to receive the stationary blades. The casing is designed to act as a beam in the support of the turbine and compressor system, and it is stiffened by several longitudinal ribs welded to the outside of the casing.

The twenty rows of compressor moving and stationary blades will be produced by precision casting.

Forced lubrication will be provided by pumps driven by the main reduction gears, with an auxiliary motor driven pump receiving its power from batteries for use in starting or emergency. Lubrication oil will be cooled by a radiator with motor driven fan, similar to the installations on present diesel locomotives.

A flyball type speed governor will be driven by the main reduction gear. It will operate in conjunction with the control system to maintain the desired speeds by controlling the rate of fuel flow to the combustors in the low speed range and by controlling the excitation when operating in the constant temperature range.

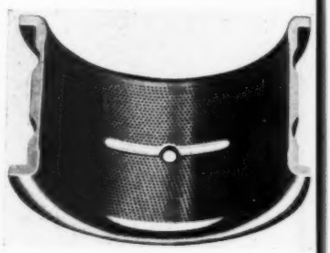
A pawl and ratchet type turning gear will be used to turn the rotating elements during periods of turbine inactivity.

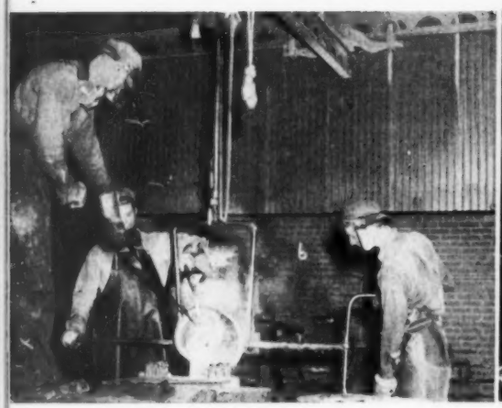
A straight tube regenerator will be mounted in the top of the cab to recover heat from the turbine exhaust gases, resulting in a considerable decrease in fuel consumption.

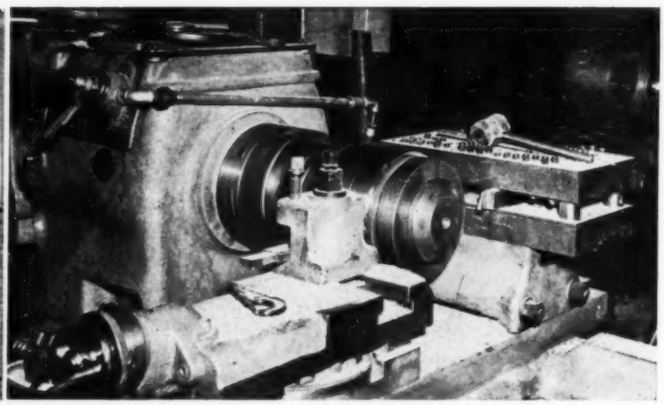
In order to achieve desirable distribution of weight and minimum volume within the cab, the generating plant driven by the turbine has been designed in the form of a two shaft generator with two armatures on each shaft. This arrangement has the added advantage of being low in height, permitting the mounting of auxiliaries above the generator. Two 175 kw. alternating current generators, a 30 kw. Regulex exciter, and a 40 kw. direct current generator, are thus mounted above the generator and are driven from the main reduction gear.

The unit will be started by two of the four main generators acting as motors to bring the unit up to the starting speed of approximately 1600 rpm. Power will be supplied by the locomotive battery or by a 200 horsepower diesel generator.

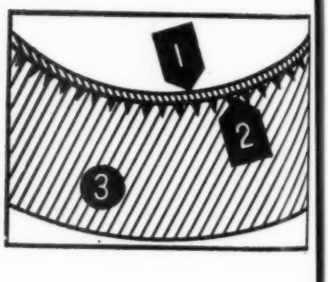
What About Gridded Bearings?







(Above) Gridded Bearing showing grids which act to protect bearing surfaces. (Far left) Molten bronze alloy being poured for a centrifugally cast diesel locomotive bearing. (left) Machining a diesel main bearing on an automatic lathe. (below) Cross section of Gridded bearing shows (1) .002" lead-tin run in surface: (2) grids filled with babbit. (3) centrifugally cast lead-bronze shell.



BLACK core sand and a battery of glowing furnaces identify it as a foundry. A cherry-red pot of molten bronze slides along suspended by an overhead conveying system and pauses over a newly prepared mould. You are witnessing the beginning of a main bearing for a diesel locomotive.

All this took place recently in St. Louis at the National Bearing Division of the American Brake Shoe Company, one of the many concerns vitally interested in diesel engine bearing development. The Division has experimented with many different metals and alloy seeking the ideal type for diesel application. A metallurgical laboratory operated by the parent company has aided in this research.

High bearing loads in diesels have made new bearing materials mandatory. Babbitt, which was one of the important discoveries in the advance of bearing science, is still the most widely used anti-friction metal but it also has undergone changes both in application and structure.

Let us consider briefly the requirements of a satisfactory bearing. It must pass five major tests: 1. Fatigue strength, 2. Embeddability, 3. Seizure resistance, 4. Corrosion resistance and 5. Bondability—if a lined bearing.

Emphasis on fatigue strength was brought out in the period of development of the copper-lead steel back bearings, since in that period bearing loading was critically increased. This bearing fatigue failure is a combination of the interruption of lubrication locally and intermittent heating and cooling which causes tensile stresses in the bearing metal which, combined with the normal compressive stresses, cause cracks. These cracks, subject to oil pressure result in spalling.

The *Embeddability* requirement of a bearing is its ability to "absorb" dirt which would otherwise score the journal.

Seizure Resistance is that quality of bearing material which permits it to resist the seizure of journal and bearing. Babbitt with a lead base offers the highest resistance to seizure.

Corrosion Resistance of most bearing alloys has been improved by the overlay of lead-tin or lead-indium. However nearly all of the bearing materials can be corroded by some set of conditions depending on the type of acid and temperature. This is one reason why the neutralization number of lubricating oils is so important in diesel operation.

Bondability, or the capacity of bearing metals to be bonded together is mainly a matter of care in the bonding process. Centrifugal casting under electrical control offers a good method of bonding.

Now that we have discussed the requirements of bearing metals, let us go into the development of the centrifugally cast lead-tin bronze bearing. Just before the war period when steel tubing became unavailable for diesel engine main and connecting rod bearings, it was believed that a material of good conductivity and uniform density

would eliminate the weakness of a bonded bearing. It developed that the centrifugally cast copper tin-lead material with .002 in. of lead tin coating in the bore would do the job. The addition of centrifugal casting did much to increase the life of these bearings. The increased loading of bearings during wartime led further to the development of the gridded bearing, which met even more successfully the bearing requirements outlined above. Briefly, this process of gridding utilizes a machining process which indents the bronze parent metal to a depth of .020 in. over an area of from 25% to 60% of the surface of the bearing. The grids are then filled with silver-lead babbitt and a .002 in. run-in surface of lead tin electro-plated to the bore. This run in surface adds to the corrosion resistance and seizure resistance of the bearing. In the case of excessive fatigue action, the gridded bearing may lose babbitt from individual indentations, but this does not affect the operation of the bearing until it becomes excessive (50% or over).

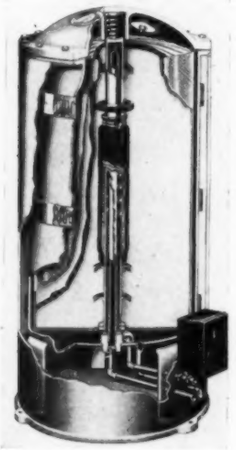
At the present time these bearings are operating on loads in diesel engine connecting rod bearings in excess of 4,000 psi projected area. In some cases, they are operating with shafts of as low as 160 Brinell hardness.

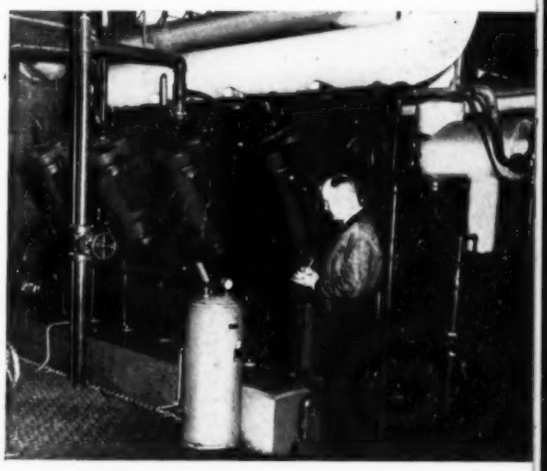
These bearings have stood up well in locomotive service which is reputed to be one of the most exacting fields of diesel application, where temporary overloads and resultant bearing pressures are common.

The manufacture of these precision bearings requires great care. Tolerances are measured to the thousandth of an inch for each bearing whether for replacement or original equipment must fit.

View of Polymer Corporation plant at Sarnia, Ontario.

View of Honan-Crane Purifier showing construction details.





Ingersoll-Rand 300 hp. gas engine equipped with Honan-Crane Clarifier.

10,000 Hours Between Overhauls

Polymer Corporation Engines Thrive on New Oil Purification System

FORTY-THREE gas engine compressors operating 24 hours a day, year after year, use a lot of lubricating oil. This is especially true if periodic oil changes are required. The Polymer Corporation Ltd. of Ontario, Canada, who owns the 43 engines, was the first to realize this fact.

Polymer produces all of its own steam and electrical power requirements. It operates its engines on gas which is a derivative of the petroleum crude from which Polymer elastomers and other products are processed. This plant is currently producing huge quantities of styrene and other chemicals for plastic and chemical manufacturers.

C. P. Ambler, Chief Refrigeration and Compression Engineer at Polymer, decided that some thing should be done about the 4950 gallons of lubricating oil which were being lost yearly by crankcase oil changes at the plant. His work had shown that oil performance in the engines was unpredictable. For instance some high grade oils would fail after very short service and others would last over 2000 hours and still retain good lubricating characteristics. He discovered as he progressed that the severity of engine service had a direct bearing upon the life of the lubrication oil. He concluded from these facts that the answer to his problem was oil purification.

A year was spent by Polymer in testing various types of oil filters. A special testing set-up was installed whereby weekly inspections and chemical analyses were made on the crankcase oil of each engine under test. Engineer Ambler as a result of his previous experience concluded that a neutralization number of .07 was the outside limit for service oils. This was one of the requirements for the test filters and it made the selection of a fullers earth type filter mandatory, since fullers earth is required to remove acid contamination from oil.

The results of the year's test was the selection of Honan-Crane purifiers for all of the 43 engines. This type was chosen because of its adaptability to the particular problem faced by Polymer.

The engines in the plant are Worthington and Ingersoll-Rand. There are twenty-five 300-hp. Worthington gas engine compressors and eighteen 800-hp. Ingersoll-Rands. The cost of oil purification for each engine is about $1 a week. The general internal condition of the engines equipped with purifiers has improved considerably, but it is too early to put this improvement into definite figures. The complete overhaul period has been extended from 7,000 hours to 10,000 hours and a further extension to 14,000 hours is contemplated with a short downtime at 7,000 hours for valve inspection. The average number of horsepower hours per imperial gallon runs approximately 4,000. A 1,000 hour test is now in progress at the plant to determine the effect of oil purification upon ring sticking. Results so far indicate the ring condition has been improved.

The life of the refills varies from 1,000 to 3,000 hours of continuous duty in severe service. The filtering medium of these refills is "Cranite," a fullers earth which has been processed to remove all dust and silt. It has a double action, that of filtering and adsorption removing both abrasive particles and contaminating acids.

New Two Cycle Diesel

THIS new engine was designed and patented by Mr. B. A. de Waern of Stockholm, Sweden, who for about twenty years was Chief Engineer of the company in Sweden making the well-known Bolinder semi-diesel engine. That engine is known all over the world for its dependability, and is in use by many of the fishing fleets on the Pacific Coast. The manufacture of the new de Waern engine began in 1940.

The new engine was patented in the U.S.A. August 27, 1946. The engine at present is made in 12 hp. size, 1000 rpm., and with two cylinders in 24 hp. size. Under construction now is a 2 hp., 2500 rpm. outboard diesel engine.

The compression ratio is 15/1, and the weight of the 12 hp. engine is 814 lbs., which equals about 68 lbs. per horsepower. By the use of light metal this weight can be cut 176 lbs. to a total of 638 lbs., or about 53 lbs. per horsepower.

The fuel consumption, which is excellent, is illustrated by the performance curves of engine No. 1 below.

Due to its design, this engine is as free from vibration as a 4 cylinder engine. This is accounted for by the built-in air compressor, supercharger, located in the bottom of the crank case, as shown in the drawing below.

Not only do these two compressor pistons balance the main piston, but the compressor delivers air for scavenging, which promotes fuel efficiency.

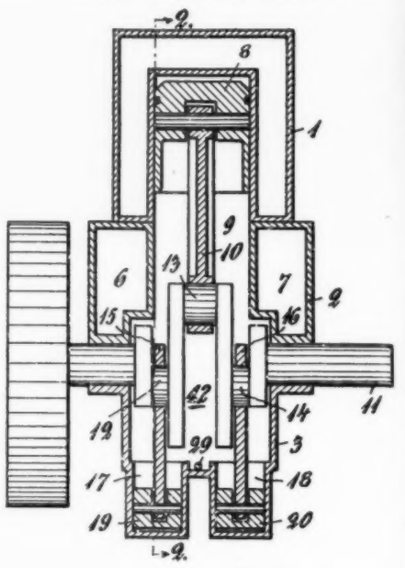
Another important item in the design is the lubricating system, as described in the patent specification. It is interesting to note how simply and efficiently it operates, especially since, on account of the compressor, the crank case can not be filled with oil.

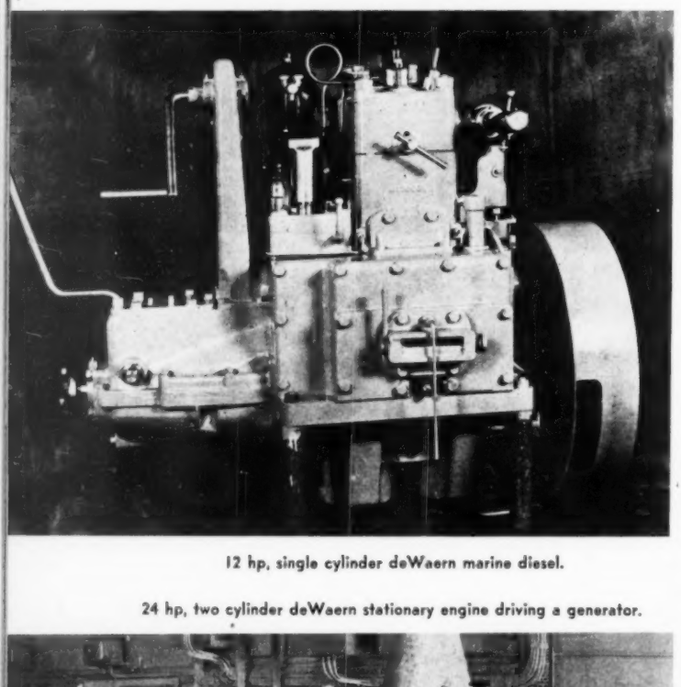
Due to their dependability and other good qualities, these engines have found a good market in the life boat field.

Even when throttled down to a very low speed, the engine is smooth and turns over easily. Since it is a two cycle engine, it is remarkable to what degree the rpm. can be reduced and still have a smooth and even-running engine.

Some time in the future a license will be issued for the manufacture and sale of the de Waern engine in the U.S.A. by Linden and Company, which concern controls these rights.

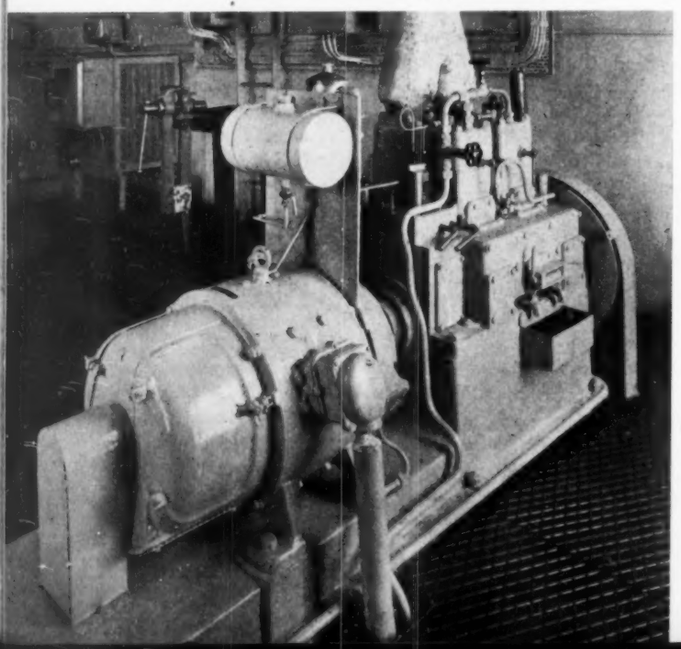
Patent drawing of deWaern diesel showing air compressor cylinders at bottom.



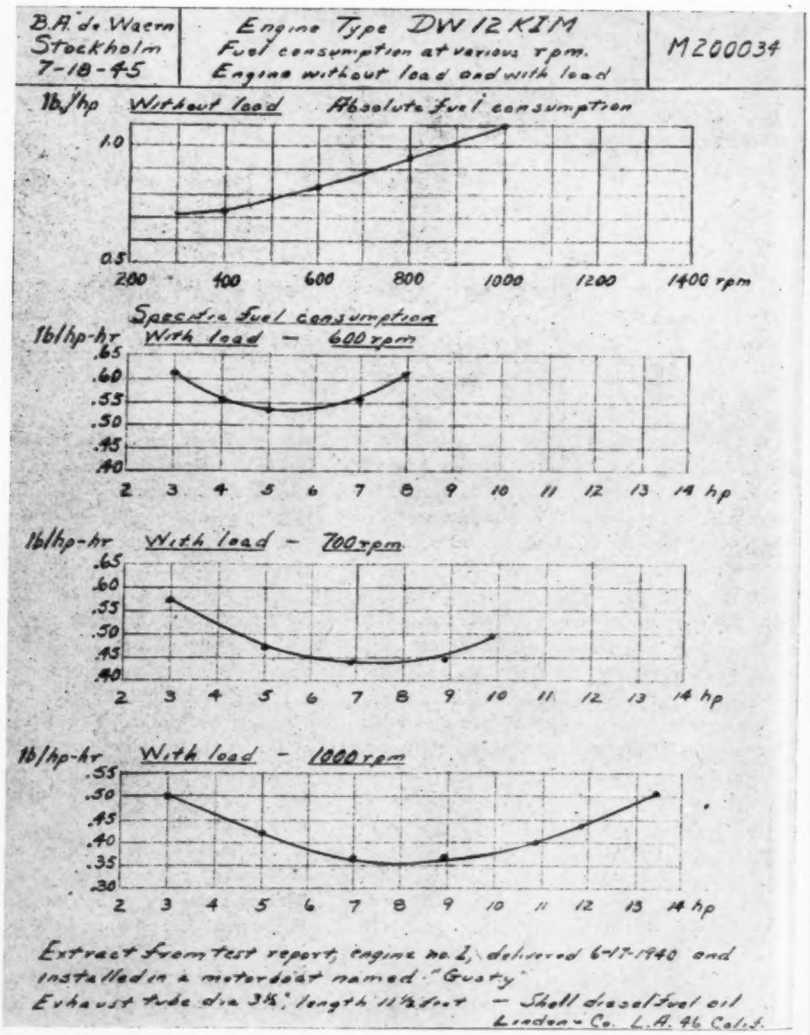


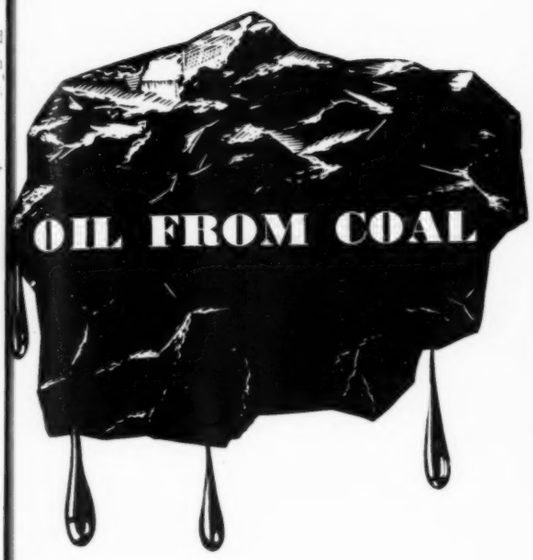
12 hp, single cylinder deWaern marine diesel.

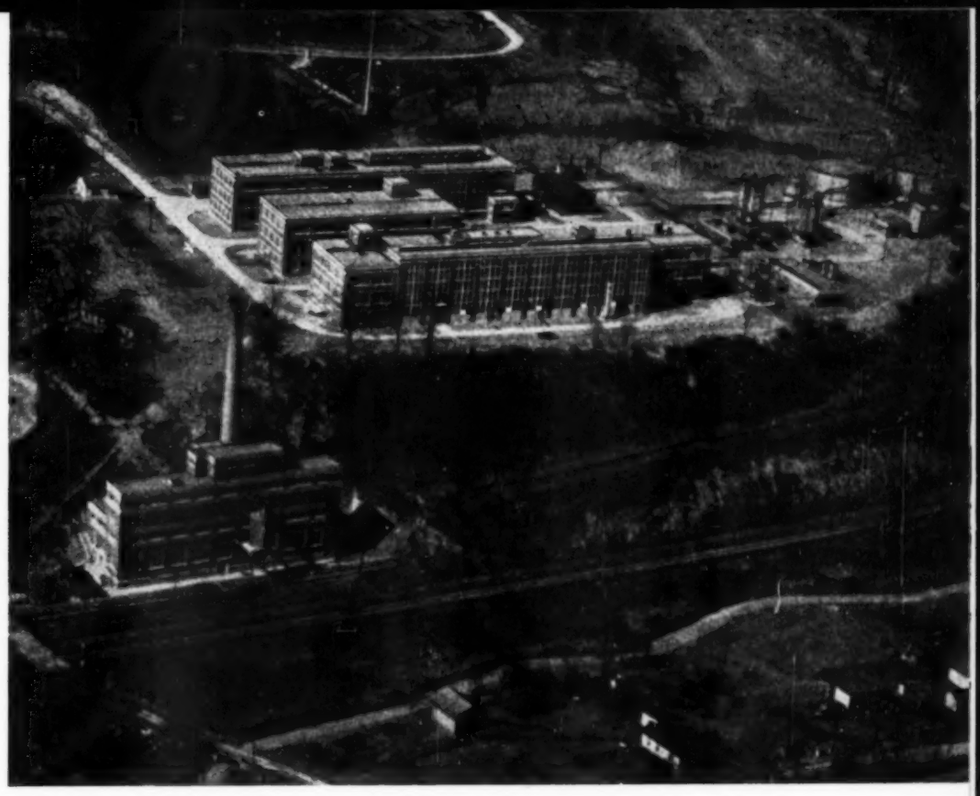
24 hp, two cylinder deWaern stationary engine driving a generator.



Fuel consumption curves for new 12 hp deWaern engine.







Air view of the synthetic liquid fuels laboratories at Bruceton, Pennsylvania.

AMONG sources outside the petroleum industry itself to which the United States must apparently look for means to cover its increasing requirement for liquid fuels is coal. German inventors in 1911 proved that a synthetic petroleum can be made from coal and lignite, and American inventors have carried the proposition far beyond where the Germans left off.

From the standpoint of chemical technology, the steps by which petroleum may be obtained from coal are very well known, and the sole remaining problem is to conduct the process within limits imposed by current economic conditions of cost and price. This is still a large problem, but the petroleum industry and the coal industry have joined forces to make a large-scale attack on it.

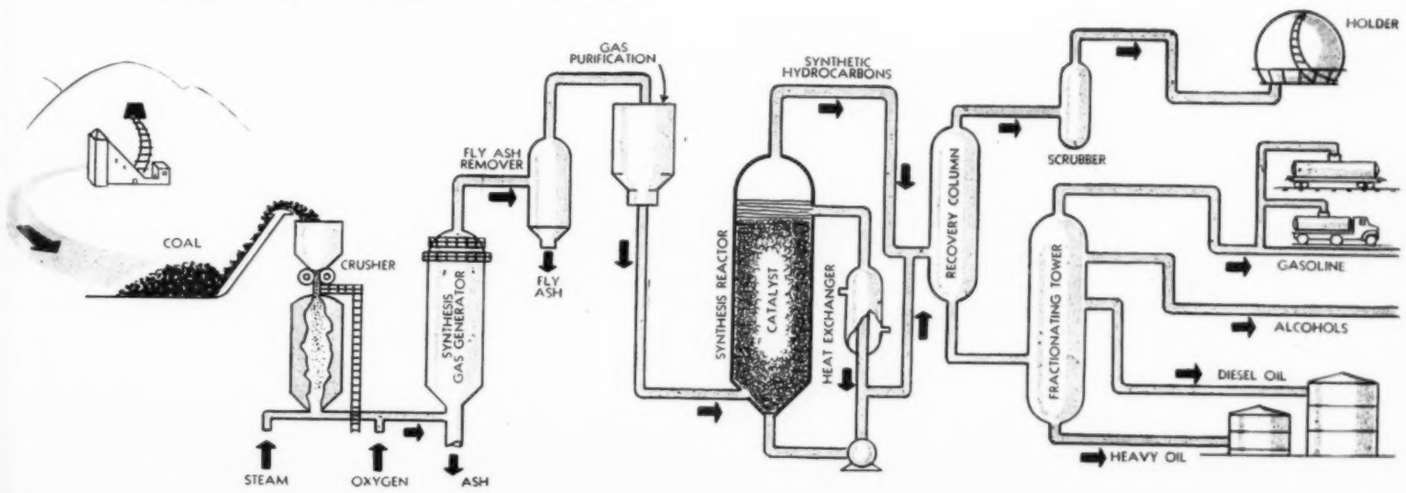
The reserves of coal and lignite in the United States are enormous. It has been calculated that the quantity available for conversion to liquid fuel is about 3.2 trillion tons, equal to about 4.7 trillion barrels of gasoline, which would cover the needs of this country for several thousand years. Coal and lignite represent 98.8 percent of this country's mineral-fuel energy reserves (excluding atomic power elements). Of the remainder, petroleum proved reserves represent 0.2 percent, natural gas 0.2 percent, and shale oil 0.8 percent.

Oil companies never will be without plenty of oil to sell, provided they can make it cheaply enough from coal. On the other side, the coal companies are much interested in extracting values from their coal that will put their commodity in a better position and one that will harmonize with the interests of the oil companies.

The Standard Oil Development Company has joined the Pittsburgh Consolidation Coal Company in a major attempt to settle the question of the economical production of gas and gasoline from coal. The engineers of the two companies have completed an exploratory program of laboratory work and engineering evaluation and are proceeding with a large-scale pilot plant located at Library, Pa.

This plant will work toward two distinct but not necessarily conflicting objectives. The pilot plant now going up reflects these objectives by a combination of a coal gasification unit and a synthetic fuel unit (see diagram). The first of

Diagrammatic arrangement of proposed method of coal synthesis.



these units will generate a synthesis gas, and the second will convert this gas into a mixture of high Btu gas and synthetic oils. The process will use the following sequence of operations:

(1) Run of mine coal is crushed to fine sizes and conveyed to a tank for drying and blending.

(2) Coal, steam and oxygen are brought to a temperature of 2000°F in a fluidizing reaction generator, thus forming carbon monoxide and hydrogen plus a considerable amount of carbon dioxide.

(3) The carbon monoxide and hydrogen are combined catalytically under conditions of pressure and temperature that are required to form liquid and gaseous hydrocarbons.

(4) These liquid and gaseous hydrocarbons are separated, the carbon dioxide is removed from the gaseous hydrocarbons, and the resulting high-calorie gas is stored in a gas holder ready for consumption. The liquid hydrocarbons are separated in a fractionating tower, giving gasoline, alcohol and other oxygenated products, diesel oil and a small quantity of heavy residue oils. The joint result is that the coal company has gas and the oil company has oil to supply their respective customers.

The fluidizing synthetic gas generator is one of the major keys to the success of the process of oil from coal. The idea was borrowed from the practice of catalytic oil cracking. In a catalytic oil cracker a finely powdered catalyst is kept suspended in an upward-moving stream of hot oil vapors; the catalyst and oil vapors come into very intimate contact, and the large oil molecules are broken down to the size of gasoline molecules. On exactly the same principle finely powdered coal and an appropriate finely powdered catalyst are suspended in a rising current of steam and oxygen, which are combined to form the gas from which synthetic oil is made. This method of gasifying the coal makes it extremely convenient to perform the operation in very large vessels and to control the generation of heat. These are features that were unknown to the Germans during the late war.

The production of gas from coal and its conversion into synthetic oil products represents the principal interest that the Standard Oil Development Company has in the project. The Pittsburgh Consolidation Coal Company has other, but not conflicting, interests: it has reached a conclusion that the coal industry must and can improve the preparation of its products for marketing. The marketing of coal in lumps is costly to all concerned. Consumers want coal of low ash content, which necessitates the operation of expensive cleaning and preparation plants. Among other things the coal industry needs a better coal refining process and a way to sell its product in its most convenient form. The most ideal of all fuels for stationary heating units is a rich gas supplied from a pipeline, and an efficient gas-generating plant is the most logical form a coal refinery can take. Since high-ash coal (up to 30 percent ash,) can be gasified by the fluidizing method, there is not only no need for expensive coal cleaning and preparation equipment, but it becomes possible to use easily mined coal deposits that are not otherwise fit for exploitation.

Another motive that has induced this coal company to throw large resources into synthetic oil research is the seasonal nature of the market for gas, whether natural or manufactured. The peak demand comes in the three winter months, when consumption often runs ahead of supply, and during the rest of the year the gas-producing facilities operate below capacity. The manufactured gas industry would be in a better position if it could find off-season use for its equipment in the production of synthesis gas for conversion into gasoline and fuel oil. Here is where coal interests and petroleum interests dovetail. There is, apparently, no reason to doubt the future of gas as a domestic and industrial fuel, if it can be produced cheaply enough; the actual and potential demand is great, and it seems that pipelines from the natural gas fields cannot be built fast enough. Once a large supply of high-calorie manufactured gas is available, there is no reason why it may not be distributed by pipeline. The success or failure of an oil-from-coal project will depend on factors outside the plant where the actual conversion of the coal to oil takes place. The coal must be mined, transported to the coal refinery, reduced to powder and delivered to the hopper that feeds the synthetic gas generator. From there on, the process of oil from coal is practically an exact parallel of oil from natural gas; from the engineering standpoint, the various steps are almost identical. In the American version of the Fischer-Tropsch synthesis, the raw material—natural gas—is converted into carbon monoxide and hydrogen by a finely powdered catalyst, using the fluidizing technique. In the new conception of a coal refinery, the raw material—finely powdered coal—is mixed with a finely powdered catalyst and converted into the same mixture of carbon monoxide and hydrogen by the same fluidizing technique. The financial feasibility of manufacturing gasoline from natural gas, which starts with the operation of producing a synthesis gas, has been amply demonstrated. The financial feasibility of manufacturing gasoline by a practically identical operation with coal can almost be taken for granted. The only trouble that could arise would be due to the presence of coal ash and sulfur in the gas generator, and from all appearances this circumstance will not have much influence on costs.

The pilot plant at Library needs to settle only such questions as reaction time, temperature, pressure and gas velocities, how to prepare the coal for the operation, how to charge it into the reactors, how to recover the gases and by-products and how to separate the sulfur and the ash. It is hardly to be expected that these matters will create much more difficulty than in the parallel operations with natural gas. These problems will be the special care of the oil technologists brought into the project by the Standard Oil Development Company. The factors that will really determine the cost of oil from coal will be found at the coal mine, and between the mine and the gates of the coal refinery. It will devolve on the coal mining engineers to see that coal is delivered to the coal refinery at a cost no greater than the cost of delivering an equivalent amount of natural gas to the hydrocarbon-synthesis factories at Brownsville or Garden City, for example. The high officials of the Pittsburgh Consolidation Coal Company have expressed a firm opinion that this can be done. Out of their large holdings they have set aside adequate reserves at selected sites and are testing entirely new mining machinery to produce safely and at low cost the special form of coal required by a synthetic oil plant. If it should transpire that oil from coal cannot compete at present costs and prices, the coal company will at least be ready if and when the economic pictures changes.

If the pilot plant at Library turns out successfully, the Pittsburgh Consolidation-Standard Oil cooperative venture is expected eventually to lead to the establishment of a $120-million commercial coal-gasification plant in the Pittsburgh district. When completed, this plant is expected to utilize millions of tons of coal which cannot be mined and shipped economically under present conditions and, according to estimates, will turn out 1,200,000 to 1,400,000 barrels of liquid fuels a day, or 100 to 400 million cubic feet of heating gases according to seasonal demands.

The joint interest of the petroleum and coal industries in oil from coal is again shown by a recently-announced agreement between the Gulf Oil Corporation and Koppers Company, Inc., for cooperative research and development of processes for the conversion of coal to gas and liquid fuels. A forthcoming result of this cooperation will be the erection of a pilot plant, also in the Pittsburgh district.

Other oil companies are known to be interested in various degrees in oil from coal. The Texas Company has completed a new research center and pilot plants at Montebello, California, where, besides work on the Synthine process applied to heavy fuel oils, work is being done on the conversion of various types of coal to oil.

While the Bureau of Mines is carrying out its work on oil from coal in its plants at Louisiana, Missouri, and its great new laboratory at Bruceton, Pa., it is keeping alive its project on the underground gasification of coal. The results of a first experiment on a coal seam at Gargas, Alabama, have now been analyzed, and both the Bureau and the Alabama Power Co., which cooperated in the enterprise, are of the opinion that the experiment was justified and warrants a new trial on an expanded scale.

The Bureau of Mines announced on June 22 that it had signed a $411,000 contract with Alabama Power Co. for the second experiment. Alabama Power will contribute a 300-acre tract containing a 40-inch coal seam with a 100-foot overburden, and will provide engineering and operating services on an actual cost basis. Plan is to use higher temperatures and pressures to more than double Btu value of the gas produced. This trial is expected to settle the question of how

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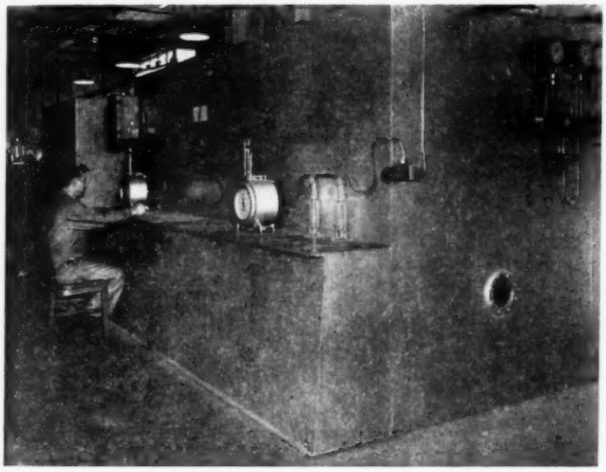
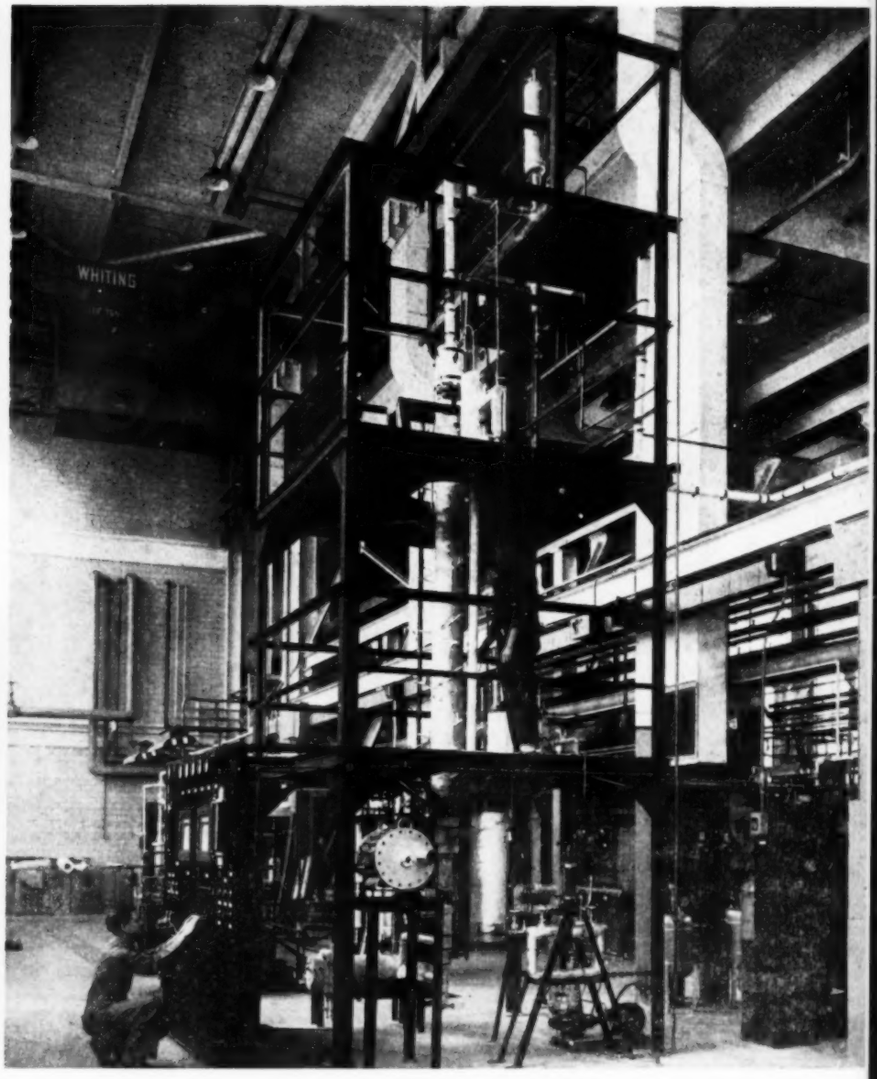




Views in the Bruceton Laboratories of the Bureau of Mines. Above: Viscosity of oils bench in the analytical laboratory. Right: Gas synthesis internally cooled pilot plant. Below: High temperature autoclave barricade.

much coal can be recovered in usable gas and whether the method will burn out the coal.

Accumulated experience here and in Russia indicate that with a cheap supply of manufactured oxygen, it is possible to produce from the coal seam itself a rich gas suitable for making synthetic oil. The use of manufactured oxygen for the underground gasification of coal has its parallel in the use of oxygen in the conversion of natural gas in Synthine plants and in the gasification of coal for the same purpose in the numerous pilot plants now operating or building. If the Gargas project gives the desired answer, the economic problem of oil from coal would be settled beyond doubt.

At the present time the major project undertaken by the Bureau of Mines, which is executing the government's program, is a $10,000,000-demonstration plant for producing synthetic oil by the direct hydrogenation of coal. This plant, which is located at Louisiana, Missouri, is designed to produce about 200 to 400 barrels of oil a day, depending on the kind of coal used. The process to be used in this plant is based on the Bergius process, which was the main reliance of the Germans for synthetic oil during the war. This process is notoriously the most expensive of all methods for producing synthetic oil, and not a single oil or coal company is now showing any interest in it. However, the Bureau of Mines has some hope of bringing it within the range of practicality by introducing some improvement over the German methods, consisting of automatic instead of hand control to give greater throughput and trouble-free operation; but the use of plant gases and direct gasification of coal to furnish hydrogen instead of the process of making it from coke, and on a more highly efficient recovery of heat. If the major portion of this work is successful, the thermal efficiency of the hydrogenation process will be raised from the 30 percent attained in the German plants to more than 50 percent, which should make quite a difference. In the meantime further work on improvement of the Bergius process is going on at the Bureau of Mines' new $3,500,000 synthetic fuels laboratories and pilot plants at Bruceton, Pa. There the Bureau is working out a process for the hydrogenation of dry coal without having to mix it with an oil medium to make a paste, as the Germans did. It is further expected that catalysts will be found which will allow the Bergius process to operate at relatively low pressure, particularly for the production of fuel oil. The expected success of these studies should go far toward bringing major changes in the economies of coal hydrogenation.

Besides this work on coal hydrogenation, the Bureau's installation at Bruceton will carry on research and development work on production of oil from coal by the Fischer-Tropsch process. In this project an interesting departure from the fluidizing technique will be tried. The synthesis gas will be produced from powdered coal by the action of steam and oxygen, according to the fluidized technique, but instead of applying this same technique to the conversion of the synthesis gas to oil products, the engineers of the Bureau of Mines have a new idea. This is to pack the converters with a granular catalyst flooded by a hydrocarbon liquid. This differs from the current fluidized bed in that the cooling liquid, instead of being circulated in tubes as in the classic cat cracker, is in direct contact with the catalyst.

From 18th Annual Refinery Issue, of World Petroleum.

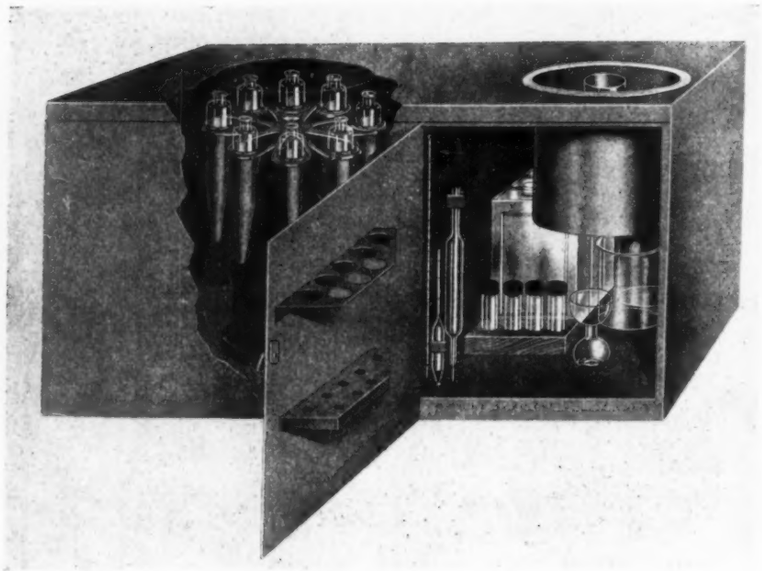


Fig. 1. Compact unit holds all oil test gear. It is marine-type unit.

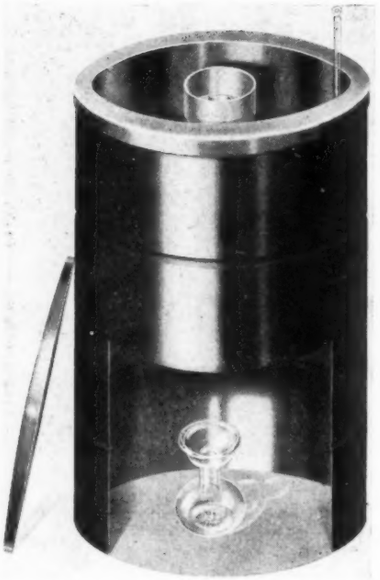


Fig. 2. New type viscosimeter allows viscosity reading at engine oil temperature anywhere from 100° to 200°.

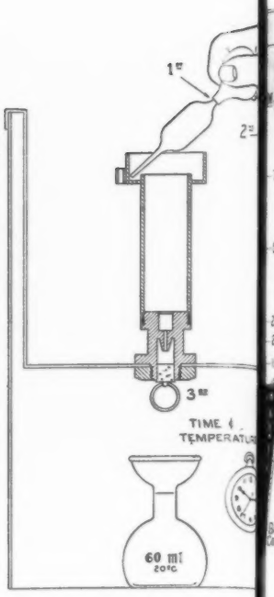


Fig. 3. Diagramtic view of viscosimeter. Operation is very simple.

Practical Lubricating Oil Tests

By FERNAND L. GERIN

TESTS to measure critical contaminants in lubricating oils are not difficult and several benefits accrue when they are made in the engine room by the operators of the engine. This article will describe simple means for measuring, in lubricating oil, the entire group of contaminants considered responsible for all engine deposits; water, dirt and metal particles; acidity; and viscosity—showing fuel dilution; also water and sediment in fuel, all within the skill of an engine room operator.

When these tests are performed by the engine operators, they put lubrication on a level with the other vital operating conditions regularly observed and recorded in the log. The importance of knowing that the lubricating oil is in proper condition is well understood and is reason enough for oil inspections.

But there is another reason equally valuable, although not so well known, for making tests each week. Changes in contaminants and in the rate of contamination are a sensitive indicator of changing conditions inside the engine. Regular oil inspections can show up many derangements early enough to prevent more serious symptoms. Stuck rings and plugged oil rings for instance reflect in increased rate of gummy contamination, partly clogged spray nozzles add fuel dilution, so do leaky fuel lines; failure of water jacket seals can be predicted by the first discovery of water; scuff metal particles mean possible seizure conditions, etc. And every so often, scrapping the entire charge of lubricating oil in the engine is avoided by discovering the leakage of water or fuel before it has gone too far.

A continuous record on the oil offers to engineers responsible for successful operation, the peace of mind that goes with knowing what is going on inside the engines, with being able to furnish running curves and data to management and when desired, to engine builders as proof of proper lubrication.

Test to Measure Deposit Forming Substances

Asphalts, resins and gums are considered responsible for all engine deposits because they are the binder material for the dirt, free carbon and metal, and they are strongly attracted to metal surfaces. The entire group of these oil-breakdown substances precipitate out of the oil sample when it is diluted with special naphtha. The cone shaped tube for making the test is graduated and the mark at the level of the precipitate is known as the "Precipitation Number." The testing routine is as follows:

(1) Pour oil in to mark 10. (See fig. 4)

(2) Add ASTM naphtha to mark 100, and mix thoroughly.

(3) Whirl the tube in a hand or a motor driven laboratory centrifuge the amount of the precipitate is read as the Precipitation Number.

Test for Sediment, Water and Scuff Metal

In this test the oil sample is diluted with industrial 90° benzene to keep the gummy asphaltic materials in solution and throw out only the solids and water. After centrifuging, the water (if present) appears as a clear layer with the solids resting on the bottom where they can be examined. Bright flakes of scuff metal are readily seen and can be identified as ferrous or non-ferrous by their color or by use of a magnet. To make this test:

(1) Pour oil in to mark 50.

(2) Add industrial 90° benzene to mark 100.

(3) Mix thoroughly and centrifuge.

(4) Record amount of water and amount of solids as water and sediment; examine nature of the sediment.

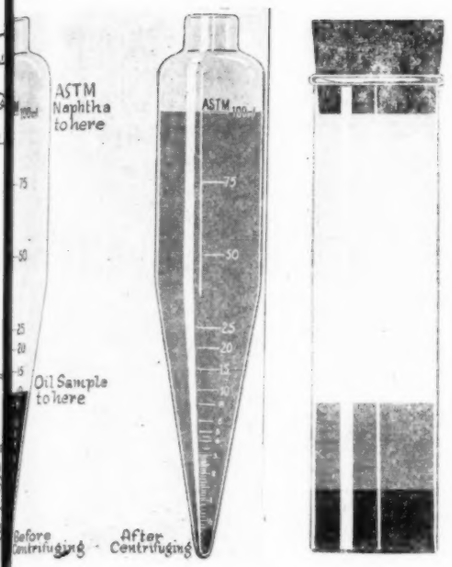


Fig. 4. Precipitation test determines the amount of deposit forming substances in engine oil.

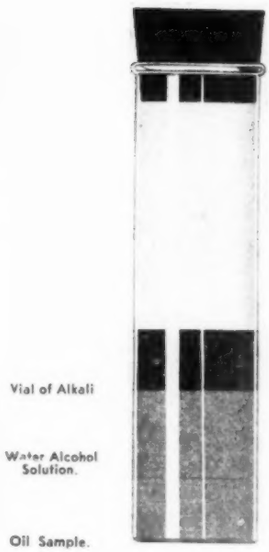
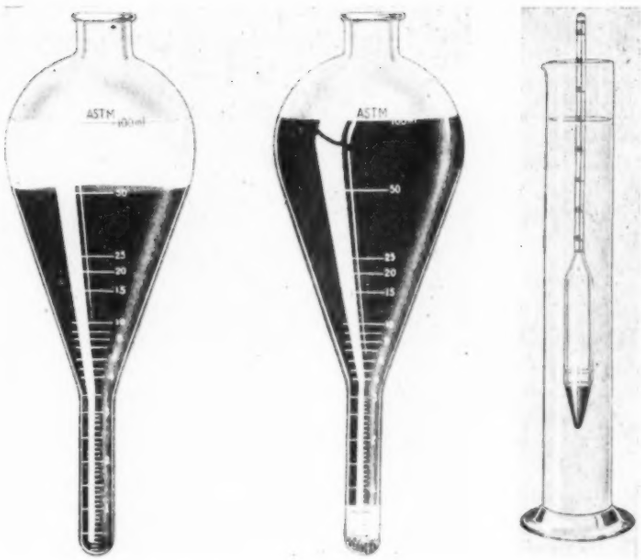


Fig. 5. Acidity test shown above determines presence of acid in oil.



Before Centrifuging. After Centrifuging.

Fig. 6. Test for sediment, water and metal utilizes centrifuge. Benzene holds asphalt in suspension.

Fig. 7. Above Right: A.P.I. gravity of oils determined by hydrometer method.

Test to Determine Viscosity

Fuel dilution reduces viscosity and asphalt increases it, but the effect of a little fuel is greater than that of a great deal of asphalt. As a rule, the influence of the asphalt is to be ignored because the oil will be condemned by the centrifuge test when there is enough of it to be taken into account.

The ill effects of fuel dilution is recently becoming more generally understood. The viscosity test for fuel is to be highly recommended because fuel dilution in lube oil occurs much more often than is recognized by operators. In some cases, it comes slowly and more or less continuous, and in others suddenly, in large amounts.

The Saybolt viscosimeter is the most widely used instrument for measuring viscosity. When an oil is rated, for instance, "95 seconds Saybolt at 100° F.," it means that when tested at a temperature of 100° F., the oil fills the receiving flask in 95 seconds of time. Viscosity measured in other instruments, for instance, Kinematic, can be translated to Saybolt and yice versa from simple conversion tables. The instrument illustrated in fig. 2 has the official Saybolt dimensions. However it has a modification to shorten the time for making the test, and is the feature which makes the instrument quite practical for engine room use because it eliminates the need for skillful handling. In engine room use the oil to be tested is poured directly into the bath with the viscosity tube removed. Then, after stirring, the viscosity measuring tube is filled from the bath and screwed in place over the orifice. Automatically, bath and sample temperatures are therefore the same.

To Operate the Viscosimeter

One quart sample of oil at any temperature between 100° and 200° F. is poured through 100 mesh screen supplied with the viscosimeter, filling the bath to the mark. After stirring for two or three minutes, the viscosity tube is screwed in place over the orifice. Excess oil is removed from the overflow rim as illustrated: temperature of the bath and seconds of time required to fill receiving flask to the mark on the neck are noted. These quick measurements are made at random temperatures and are compared to readings of other days made at other temperatures by reference to the A.S.T.M. Viscosity-Temperature charts which are supplied by the makers of the viscosimeter.

By plotting the viscosities for random temperatures, a straight line drawn through the points will enable the operator to read the viscosity for standard temperatures 100°, 130° or 210°.

The diesel operator can warm up a quart of the new oil to about 200°, and read the viscosity at several temperatures while the oil is cooling. This will establish several points for the line to represent the oil before use. Other lines can be drawn to represent diluted oil by adding fuel to new oil in measured amounts. One ounce of fuel added to one quart of lube oil is 3% dilution; 1.7 ounces make 5% dilution; 3.5 ounces 10% and 5.6 ounces 15%. Thereafter the operator can refer any readings on used oil to the chart and determine at once whether it is within a zone of acceptable viscosity.

Test to Determine Acidity

It is unfortunate that acids in oil are not visible and do not stand out for all to see them. Their invisible nature and the fact that their destructive effects pass off as a part of ordinary wear, has caused many practical operating engineers to ignore them. Yet, they slowly etch polished surfaces; some acids dissolve copper, some lead, etc., and some accelerate the deterioration of the lubricating oil.

When selecting the amount of acidity to constitute a condemning limit for the used oil, the new oil itself must be taken into account. Some new oils contain additives which while not acid in the ordinary sense, act on the chemicals used in the test for acid and thereby produce an acidity reading, which may be higher than the condemning limit for a straight mineral oil.

In a straight mineral oil the acid number will be minute, in the neighborhood of .05 before use and will be increased by the deterioration products which form during use.

The simple engine room test is done by use of two standard solutions. One solution contains only water and alcohol with a touch of phenolphthalein indicator. This indicator is pink in the presence of alkali and colorless with acid. The second solution of water comes in vials each containing a dose of alkali equivalent to acid number .30.

To make this test, referring to fig. 5 the used oil sample is poured into the glass cylinder to the lower mark. The pink water and alcohol solution is poured in to the next mark and one vial of alkali then added. On standing for a few minutes (after vigorously shaking) if the water-alcohol layer is still pink the acidity of the oil is below neutralization number .30 mg. of KOH, as it is commonly expressed, but if the layer is not pink, the oil is considered to have failed the test. The value of .3 for used oil is considered conservative as a condemning limit.

Those who wish to use other limits of more than .30 can for example use ¾ sample of oil and one vial of alkali for acidity up to .40, and acidity of .6 can be checked by using a double dose of alkali (two vials).

If the explanation gives the impression of complication, the illustrations will show how utterly simple these tests really are. Reading the thermometer is probably the single operation requiring the most skill to perform any of them.

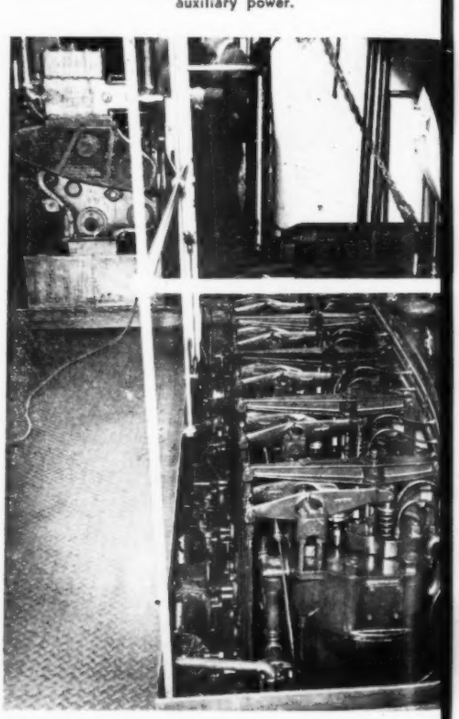
In advocating these tests, the writer realizes that most users of engines send samples of their oils for laboratory analysis, but analyses on special occasions do not supply the information required for routine operation. They are too infrequent, the answers too slow in coming, and when they do arrive, who knows for sure what they mean? For understanding of what is going on and for control of operation, continuity of data is the thing.

From Sail to Diesel

Four-master from South Seas Converted to Modern Floating Cannery

By W. J. GRANBERG

La Merced anchored in Aleutian waters serves as a floating cannery.



Engine room of vessel shows one of two 400 hp. Atlas Diesels and one of the two Cummins Diesels which supply auxiliary power.

IT'S ENOUGH to make a deep-water sailorman blubber in his watery grave, the waterfront agreed, to see a trim little lady like *La Merced* lose her canvas. Not in a blow did she lose it. No monsoon tore away her white sails, no wind on the down-under run out of Australia took her main hamper.

Man did. Man, who knows the day of sail and leisurely voyages is ended, converted the tidy four-master schooner which once plied the South Pacific to a modern and efficient diesel-driven floating cannery. And the waterfront got used to it, knowing in its briny heart that wooden ships and iron men have had their day, their glory, but must give way to progress. Even the most hoary-handed old salts shook their heads and were heard to mutter that diesel must be here to stay, so they shouldered their sea bags and went aboard *La Merced,* bound for a three-month season in Alaskan waters.

The ship, built in 1918 for the Australian run, is 240 feet long and the capacious holds of the deep-draft vessel admirably fit her new duty. She is owned by Peninsula Packers, Seattle, one of the enterprises of the fabulous Nick Bex, king fisher of the Pacific Northwest. Fitted with a compact, complete salmon cannery, the ship has a packing capacity of 60,000 cases, which means 2,880,000 cans, in a season. Fishing boats, operating under contract, supply the vessel with her salmon.

When the *La Merced* was converted from sail to power, semi-diesel engines were installed. These were replaced with two six-cylinder Atlas Imperial diesel engines, producing 400 horsepower each at 300 rpm. They are direct reversible. The bore is 13 inches and the stroke 16. Fuel consumption amounts to about 24 gallons per hour. Fitted with twin 74-inch Coolidge propellors, 44 pitch, the ship is rated at 8.62 knots.

The electric power generating plant consists of two six-cylinder Cummins diesels. One is a supercharged model and drives a 75 kw. Century generator, while the second one turns a 60 kw. General Electric unit. The switchboard is equipped with Weston meters.

The *La Merced,* skippered by Capt. Charles Graham, put out early in June for the Alaska Peninsula district where operations will begin in the vicinity of False Pass. The only canvas she carries now are staysails, set now and then to steady her in a blow while the diesels drive her homeward. And there are those aboard who say the old schooner hasn't forgotten her proud days.

LOGGING RAILROAD DIESELIZED

By CHAS. F. A. MANN

GETTING the huge sawlogs from the Douglas fir forests of Western Washington from high up on the foothills of the Cascade and Coast Ranges of mountains began late in the last century as a railroad operation and for the most part, continues to this day as a heavy-duty railroad operation, and probably will for the next century after today!

Largest operator in the Pacific Northwest is the sprawling Weyerhaeuser Timber Company, with very large logging, sawmill, plywood, pulp mill and tree farm operations in both the Douglas fir belt of Western Oregon and Washington as well as the Pine country east of the Cascades in Oregon and Idaho.

Outgrowth of a lengthy series of 19th century timber operations that grew up, passed their peak and either died or moved farther West, the chain of so-called "Weyerhaeuser Companies" scattered from the pine country of the South, through the northern Midwest and out to the Pacific Northwest, is perhaps unique in all the world of big-time industry in that while it is a raw material manufacturing operation, it is perhaps America's only large group of companies that operates on a base of raw material that will never be "mined

out"! Ore and coal and oil are irreplacable raw materials. A wood-consuming industry based on cut down the forest and scram policy is practically a fly-by-night Circus operation, but the three generations of Weyerhaeuser Timber Company have learned to practice the exact opposite policies from those of the old-time lumberman. Everything they operate is based on a perpetual cycle of cut, re-plant, re-growth, selective harvest (by areas and by size of trees) and start all over again, figured on a basis of 100 year cycles from stumps to 4 ft. timber and back to stumps again!

In Western Washington, where the original forest was one of the mightiest vegetable crops ever known on earth, Weyerhaeuser operates large sawmills and logging operations at Everett, Snoqualmie Falls, Enumclaw, Vail, Montesano (Tree Farm), and the so-called McDonald operation near Chehalis, Willapa Harbor and Longview Washington. A huge integrated pine logging and sawmilling operation is located at Klamath Falls, Oregon. Plywood, logging and sawmilling operations are expanding rapidly in the vicinity of Eugene, Oregon, in the Willamette Valley. Large pulp mills are operated at Everett and Longview, Washington and another under construction in Western Oregon.

Each of these operations is so old and has been located in one spot so long that soon each will be starting to cut the 2nd growth timber, which grows to huge size in from 60 to 100 years in this fertile soil and even-tempered climate.

A chain of sister companies operating in Idaho is operating on a long-range cycle of perpetual harvest.

With this kind of background, Weyerhaeuser Timber Company and its smaller affiliates, many of which are not wholly owned and are entirely separate in their operation, looks far into the future when evaluating methods, equipment and operating economics, whether it be a new steamship for the Weyerhaeuser Line, operating in the intercoastal service, or a new piece of control equipment for a bulldozer for building logging roads into one of their forests. It is simply impossible for the company, being what it is, a sort of a huge Braintrust-Bellwether for not only its own family of Corporate Chillun, but for a large segment of the North Coast Forest Industry as well—to go off half cocked and be whimsical about its methods or equipment. It is constantly researching toward better methods and eager to acquire the latest in equipment innovations, provided they are of proved value—all pointing toward the end of utilizing even the needles, bark and roots of the trees, utterly without waste. And also keeping sights set for the 21st Century, A.D.

Basis of the whole industry under their thrifty management, is large groups of acreage upon which the trees grow undisturbed by fire, pest or tree-pirates. Grouped about a natural watercourse to give transportation access to market, these timber stands often run to 100,000 acres or more, and are operated as a Tree Farm, on a scientific basis of securing the highest yield of usable wood with minimum of waste or expense. Piercing the heart of these huge forests is generally an "Old Reliable" logging railroad that forms a pipeline from the woods down to the mill's log pond, or connecting with another railroad, to lead away to a marketing center generally on tidewater.

Closest strictly logging operation to the busy Puget Sound lumbering area is the Vail Logging Operation, lying 25 miles East of Puget Sound, in the low foothills of the Western Cascades, in Thurston County. Some 20 years ago when logging this vast tract began, a husky standard guage steam railroad was built from South Bay, near Olympia, Wash., where the logs are dumped into Puget Sound, then made up into rafts and towed to the company sawmills at Everett, about 75 miles north of South Bay.

As the economics of logging changed, what would have been a continuing deeper piercing of the mountain timber stands on increasingly stiffer grades and sharper curves, gradually, about 7 years ago, began to give way to the system of building rough, but easy-grade roads into the various parts of the territory, over which high-bed, heavy-duty diesel powered trailer-trucks could bring down a railroad flatcarload of logs at a trip, deposit them beside a railroad log flatcar, and with an easy roll of a neatly placed cable, roll the load of logs from this high-wheel, diesel powered high-level monster truck, directly to a log flatcar on the railroad at the Woods terminal.

So big are these diesel log trucks they cannot operate on State highways and the roads are private affairs built and maintained by the company, on exactly the same status as it would have built and maintained a standard-gauge logging railroad.

Time passed and the wood burners which sparked fires in a dry summer, gave way to oil burners, and now, in June 1947, almost 20 years after the Vail logging operation began its long cycle of logging, a brand new 1,000 hp. diesel locomotive takes over the job that formerly was done by two or three steamers.

Goodbye to steam in the Big Woods of Puget Sound!

The husky diesel, having the well-known tractive characteristics is perfectly tuned to the job, for under normal operation, the logs are loaded on railroad flatcars the day before and the train made up to roll at dawn. The diesel hooks on and on a generally level or slightly downgrade "pull" it can take from 20 to 60 cars of logs down the 25 mile Vail logging railroad without effort, using its ample airbrake capacity to hold the train. Grades average 3/10th of 1% with a maximum of 2%. Near Rainier, Wash., where the logging railroad crosses the Milwaukee Railroad's Grays Harbor Branch, another branch of the Weyerhaeuser operation feeds long strings of log flats from its McDonald Camp, about 12 miles southwest of Chehalis, in the Northeast Coast Range hills. Handling from the junction point down to the log dump at South Bay, up to 60 or 75 cars from the combined previous day's output at McDonald and Vail, the arrival is timed for about 7 A.M. so the cars can be dumped and the return trip started to be finished before lunch.

Oddly, the heavy load downgrade to the waterside pier built out nearly 1000 feet into Puget Sound, is easier than the empty car haul uphill!

Here the big diesel takes hold and can maintain a constant speed of about 15 miles per hour going back into the woods.

The new diesel took over finally, after a 5 weeks strike of the boom-men at South Bay (boom-men make up the huge log rafts from the logs that have been dumped into the water from the cars), on June 7. It is a 1000 hp. Fairbanks-Morse job, with one of their 6 cylinder opposed piston diesels, driving 4 traction motors geared to four axles on the twin 4-wheel trucks. Gear ratio is 68 to 14 and the locomotive develops 34,000 lbs. of tractive effort at 8.9 miles per hour. The big diesel has 8⅛ in. bore and 10 in. stroke (both upper and lower pistons, and delivers its full rated output at 800 rpm. The short wheelbase of 33½ ft. (cab—rigid) and 8 ft. truck wheelbase gives it ideal qualities for negotiating short curves and over short-radius switches. Maximum speed is 60 mph. with 40 inch wheels, and it has a maximum tractive effort at starting of 72,000 lbs. Total weight is 240,000 lbs. loaded with 28 cu. ft. of sand; 100 gallons of water; 740 gallons of fuel and 140 gallons of lube oil. Westinghouse airbrake gear is fitted, with a 3 cylinder, 2 stage air compressor delivering 246 cfm. into the 60,000 cu. in. air reservoir.

All servicing and repairs are done at the Vail terminal, with special emergency facilities available at mainline railroad shops in Tacoma.

1000 hp. F-M diesel locomotive hauls logs out of forest in 60-car-load lots.

Peace of Mind for

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Operating and maintenance headaches make life tough for engineers . . . make operators wish they had a friend. That's where GASCON OIL comes in. It *makes life easier* for the Diesel engineer.

Inherent qualities in the basic crude give GASCON *natural ability* to clean engines and keep them clean . . . to wash away and disperse carbon and crankcase accumulations.

The effect of these qualities on Diesel operation gives engines longer time between tear-down . . . more continuous operation time . . . lower maintenance cost . . . more efficient operation.

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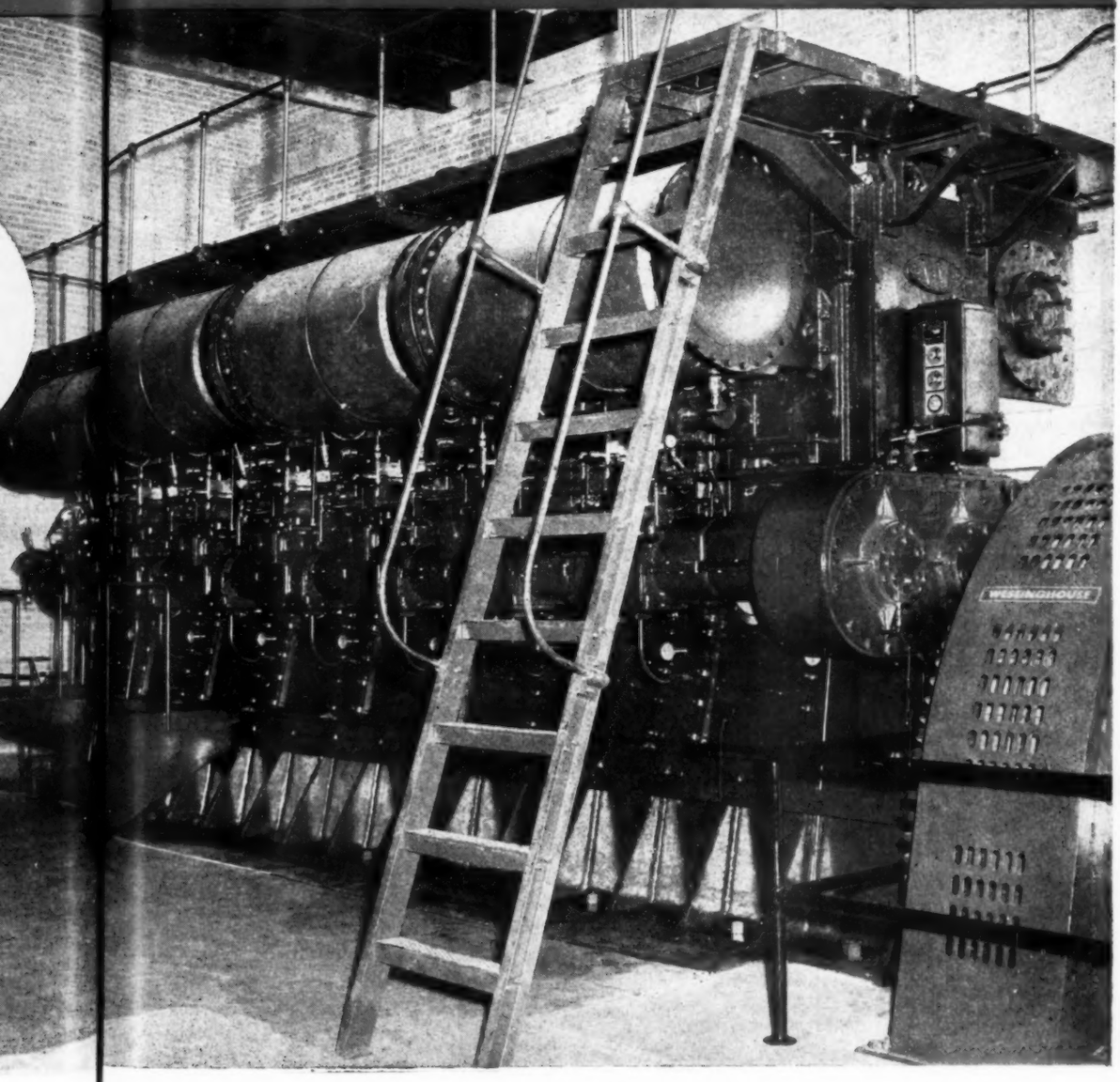


INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVE., NEW YORK 20, N.Y.

Refinery Railroad Switches to Diesel

By W. D. ARMINTOR

Two 500 hp. Whitcomb diesel electrics

String of tank cars behind new diesel at refinery

IT is doubtful if there is any phase of industry which is so fascinating to the average person as railroading. From early American history, the saga of railroading has indeed been one of romance and adventure. As proof, one has only to recall the immense popularity of the railroading epic, "Casey Jones" or, to drive the point home, see who enjoys most Junior's new electric train under the Christmas tree.

The recent arrival at Gulf's Port Arthur Refinery of two new 500-horsepower 70-ton Whitcomb diesel-electric locomotives caused almost as much excitement as the Spindle Top gusher must have caused almost fifty years ago.

Old timers were reminded of the early days in the plant before Gulf owned a switch engine, when the Kansas City Southern and Texas and New Orleans Railroads, which serve the plant, handled what few cars were then required.

Just as the nation expanded and moved to new and unexplored horizons to the South and West and the ribbons of steel followed, the Refinery railroad system followed the growth of the plant from one covering a few hundred acres to its present size of more than 3,500 acres.

The operation of the system in the Refinery is not unlike the operation of any of the nation's railroads, only, of course, on a smaller scale. However, it would be safe to say that the trackage and equipment operated within the two-mile-square area would exceed that of many a public carrier in the United States.

Like a cross-country system, there is a main line extending from the north to the south side of the plant, and the various processing units, mechanical shops, packaging plants and the docks are served by spurs and sidings not unlike cities and towns away from the main line are served. Also, there are repair shops and spots where the equipment can be serviced and kept in running order, and classification yards and storage spurs where the cars are segregated.

Within the plant enclosure, there are over twenty miles of track, and in addition, the carriers' tracks are used to reach some outlying plants adjacent thereto. At present, equipment being operated consists of the two new Whitcomb diesels, forty Boxcars, about one hundred tankcars, and about fifteen other types of cars such as flats, crates, and gondolas. Also operated on the tracks are six locomotive cranes of up to 50-ton capacity. A 44-ton gasoline-electric locomotive and one small steam engine are maintained as spares. The above mentioned equipment is entirely intra-plant, and in addition, about seventy-five tank, box, and other type cars are received and shipped over the carriers' lines daily. About 4,500 cars are being handled each month at present.

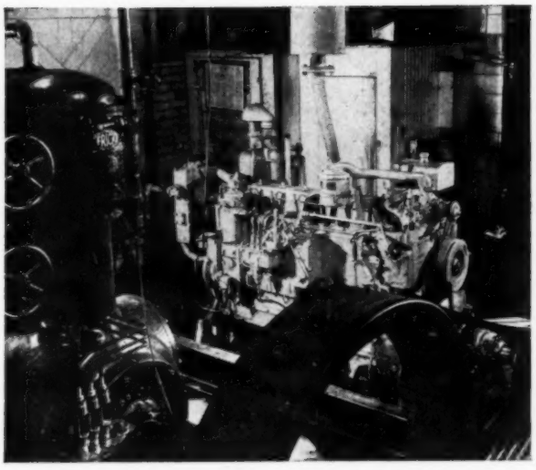
One might wonder why so much equipment is required in a single plant. The processing of about 200,000 barrels of crude oil daily requires hundreds of tons of materials such as chemicals, clays, and catalysts. Construction and maintenance of the equipment require more tons of steel, lumber, pipe, brick, etc., and shipments of finished products require thousands of drums and other types of containers. Although much of this equipment is received by company tankers, it must be transferred to cars for distribution to points of use in the plant, and much of it is received from and shipped to inland points by all-rail movement.

The transportation department consists of 35 employees comprising four crews, clerks, dispatchers, and checkers. Before the war, there were only 19 employees, and all the switching was handled by one Gas-Electric Locomotive on a 12-hour day schedule.

Like many another coastal refinery, Gulf's Port Arthur plant was designed primarily for waterborne transportation aboard tankers, and the war emergency created a problem in transportation. As an example of what had to be done to meet the situation, the Transportation Department was expanded to over 100 persons. Six locomotives were in operation, half of them on a 24-hour "around-the-clock" basis. Most of these were old wood burners secured from abandoned sawmills in East Texas, overhauled and converted to oil burning in our own shops. Almost 16,000 cars were handled monthly throughout most of the war years. But like much of the war time equipment throughout the nation, it was considered expendable and, after serving its purpose, was disposed of.

Port Arthur's first switch engine was purchased in 1919. In 1923 a second and larger engine was added. This was a 90-ton steam locomotive (No. 2) which operated almost continually until 1937 when a 44-ton gas-electric unit was purchased. The No. 2 engine was used as a "stand-by" until the war, when it was again placed in operation.

P. H. Marble, Superintendent of Construction and Repairs, and an ex-railroader, has long been aware of the advantages of diesel operation, but purchase of the two new units was delayed until after the war. As soon as possible afterwards, they were ordered. One unit was delivered in August; the other in September. The units are identical, being manufactured by The Whitcomb Locomotive Company. They are of double power plant construction, each consisting of a Buda 6-cylinder 4-cycle 283-horsepower diesel engine, and Westinghouse traction generators and motors. Weight on the driving wheels is 140,000 pounds, and the maximum tractive effort is 35,000 pounds without sand, 46,660 pounds with sand.



NO DIESEL OPERATION TOO SMALL—for Cities Service lubrication engineers. In this ice-making operation where horsepower requirements are relatively low, Cities Service lubrication engineers and service-proved lubricants can produce substantial savings.

NO DIESEL OPERATION TOO LARGE. Where large amounts of power are required as in this steel operation, up-to-date lubrication techniques are essential. Here the information Cities Service lubrication engineers are able to provide has often proven valuable to such manufacturers.

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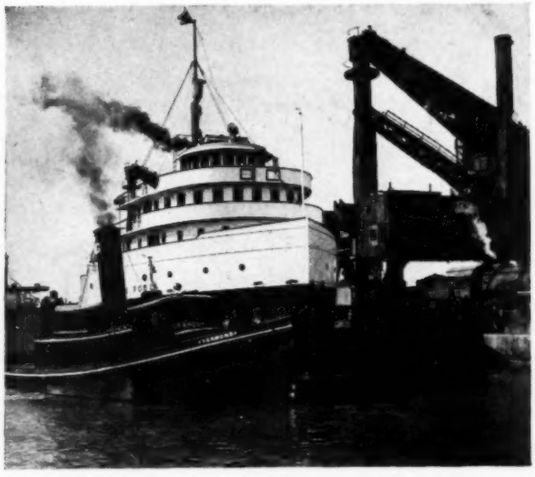

But whatever the industry that Diesel engines serve, whether on land or sea, Cities Service lubrication specialists know-how and SERVICE-PROVED Diesel lubricants have proven to be a money saving team for many Diesel owners.

Get in touch with the Cities Service lubrication engineer nearest you. His services are available free of charge and with absolutely no obligation to you. For further information write: Cities Service Oil Company, Room 195, Sixty Wall Tower, New York City 5, N. Y.

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Supervising & Operating Engineers Section

CONDUCTED BY R. L. GREGORY

Unit Installation and its effect upon Daily Operation

Part 11

CONTINUING the discussion of the special features found in the installation of the unit in question, which features make for simpler and more efficient operation, we now come to the subject of the cooling systems.

Soft Water Cooling System:

Both the old unit and the new one incorporate the closed system of circulating the cooling water. This system consists of a circulating pump on each engine, located in the basement, the attendant suction and circulating discharge piping through the unit, and an expansion tank of approximately 700 gallons capacity, which tank is located on the second gallery above the operating floor, and hooks into the suction side of the circulating pump. Thus a positive head is maintained on the system at all times.

Makeup is added to the system by means of a water connection from the city water mains to the top of the expansion tank, which tank also has a connection with a funnel at the top for injection of the softening agent used to keep the circulating water in the proper condition. This softening agent is a special agent used for that purpose and is added to the system at periodical intervals as required, with the result that the cooling agent is kept very free from scale formation.

The only drawback with the system on the original installation was the fact that there was but one circulating pump for the cooling agent. If trouble was encountered at any time with this pump, it meant a forced outage of the unit until such time as repairs could be made.

When the new unit was installed a duplicate system of the first unit was installed with the following exceptions. To make the systems more flexible and eliminate any outage on pump troubles, a spare soft water circulating pump was installed between the two units, and the piping arrangement so designed, that either surge tank, either unit circulating pump or the spare pump can be used on either engine.

Thus presuming that both units were in operation and one of the units developed trouble due to failure of its circulating pump, by manipulation of four valves the spare pump could be put into operation and thus eliminate any outage while the unit's individual pump is repaired. Furthermore the hookup is so arranged that if No. 1 Unit is down, its pump can be used to cool No. 2 engine or visa versa.

This piping arrangement is a most desirable feature and for the little added expense of extra valves and piping, we have a flexibility to the cooling system which eliminates any outage in case of pump trouble. The expansion tanks on the second gallery are so placed, and equipped with red line gauges, so that the amount of water in the tanks is discernible from the operating floor at all times.

Raw Water Pumps and Circulating System:

Here too it was deemed advisable to make these systems as flexible as possible, and while these pumps are not interconnected, a sufficient cooling water supply is maintained at all times and under all conditions by a different methods of hookup.

Each unit has its individual raw water cooling system, which system consists of a raw water pump, a suction line to a well, which suction line is equipped with a footvalve, and the discharge line passing through the soft water and lube oil heat exchangers, thence discharging into a drain back to the lake nearby.

To assure an adequate raw water supply at all times, instead of interconnecting these two individual pumps as in the case of the soft water pumps, the discharge side of each raw water pump was equipped with a valve, and just above this valve a tee was installed. A line from the city water mains was connected to this tee with a suitable valve inserted.

Should a raw water pump become defective, the operator merely opens the valve from the city main, and closes the discharge valve on the raw water pump and he has cooling water for his heat exchangers direct from the city mains. Since the city main pressure is in excess of that maintained by the unit individual raw water pumps, a gauge is installed on the discharge piping beyond the tee and proper pressure can be gotten from the city main by throttling the valve on the city main.

Such a hookup also insures a chance for pump maintenance and repairs without any outage.

Fuel Oil Heating:

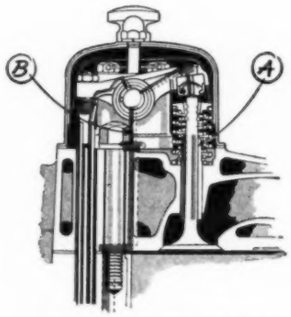
The proper operation of any large unit using heavy grades of fuel oil is more or less dependent upon the fluid condition of that oil, especially in cold weather. The two units under comparison both use heavy #5 diesel fuel, which temperature is maintained at from 110 to 125 degrees F. both summer and winter. The storage tanks, (two, of 100,000 gallons capacity each) are both equipped with heating coils, through which either hot water or steam can be circulated.

In this particular setup we are fortunate to have live steam available which is used in the colder months to keep the oil in storage at around 90 degrees F. With the oil at this temperature it is fluid enough so as to be easily passed through the fuel oil purifiers placed between the transfer pumps and day tanks, discussed in a previous installment.

On the older unit the only method of heating the oil to the unit between the day tanks and engine is by means of coils in the service tank. On the new unit, four different methods of heating the fuel oil were installed. The service tank is equipped with heating coils through which either hot water or steam can be passed. In conjunction with this set of coils a separate hot water heating device was also installed. Then as a fourth means of heating the fuel oil, a large chromilax Electric heater, thermostatically controlled was hooked up in the system. The piping arrangement was so arranged, that hot water, heated in the muffler coils, can be passed through either the coils in the service tank, or through the separate hot water heater, or through both in series by means of a pump and closed system, similar to the closed system used on the soft water cooling system.

This piping arrangement was also designed so that the fuel in passing from the service tank to the engine could be passed through the electric heater. In next month's issue a complete diagram of this fuel system with the heating and pumping arrangement will be shown.

CASE D119C--PROVIDING GOOD VALVE ACTION IN DIESEL ENGINES.



DIESEL ENGINE VALVE ASSEMBLY

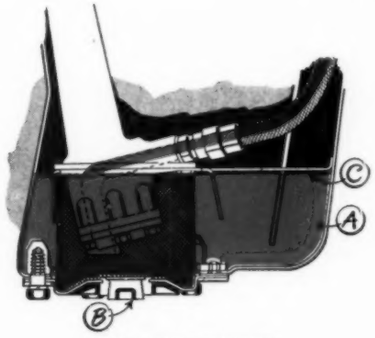
When Diesel engines, operating in tough heavy-duty service, were lubricated with compounded RPM DELO Diesel Engine Lubricating Oil, valve stems and guides did not gum up. They received thorough lubrication at all times and wear was negligible. RPM DELO Oil is recommended for all types of Diesels. Comes in several viscosity grades to meet all conditions.

A. Specially selected oxidation-resistant base stocks and special compounds prevent formation of gum and lacquer . . . oil film adheres to hot or cold metal surfaces.

B. Detergent compound keeps oil passages clean and open . . . and allows free flow of adequate supply of lubricant to wear points.

RPM DELO Diesel Engine Lubricating Oil is non-corrosive to all bearing metals. This quality and high stability assure sound bearings in Diesels for long service periods.

CASE D119D--KEEPING PARTS CLEAN AND REMOVING CONTAMINANTS FROM DIESEL ENGINES.



DIESEL ENGINE CRANKCASE

Cylinder walls, pistons, bearings and other parts of Diesel engines in heavy-duty service remained free of lacquer, and all contaminants flowed out with drainings when RPM DELO Diesel Engine Lubricating Oil was used.

A. A special compound in RPM DELO Oil loosens and removes lacquer and other deposits from parts and oil passages . . . and they stay harmlessly dispersed in the oil.

B. The finely dispersed contaminants, including condensate and dust, flow out freely when crankcases are drained.

C. Another compound in RPM DELO Oil prevents foaming —allows accurate measurement of oil levels and delivery of sufficient lubricant by oil pumps.

The engine-cleaning qualities of RPM DELO Oil help reduce wear on parts and prolong greatly the operating periods between engine overhauls.

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Exchange Your Diesel Maintenance Ideas

CONDUCTED BY R. L. GREGORY

Diesel Fuel Oil Transfer System That Avoids Contaminants

THE troubles caused by dirty fuel oil are too well known to bear stressing. Assuming the customer receives a load of fuel that meets refinery specifications for cleanliness, there are a number of sources of contamination in plant transfer equipment.

These are

1. Moisture condensed from air in the storage tanks
2. Dirt and rust from the storage tanks
3. Dirt from unclean handling equipment and transfer lines.

Delivery tanks which the customer has no jurisdiction over are at times not properly cleaned and thus must be included as a main source of contamination.

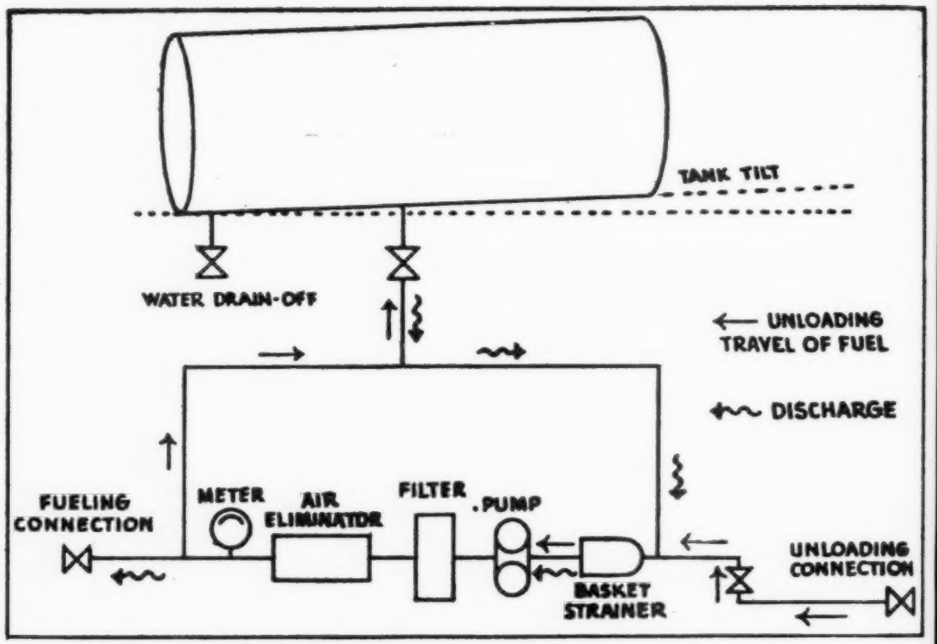
Reduction of water and other contamination products can be accomplished by a transfer system as shown in the illustration, which is typical for railroads but is here modified for lighter demands. It includes the connection to the delivery tank, a strainer, pump, filter, air eliminator, and meter. Piping can be arranged so that the same strainer, pump, filter, and meter can be used to deliver the fuel to the engine installation.

One suggestion to protect discharge and delivery hoses and connections from dirt and water is to arrange to have the hoses to swing on a boom that keeps the connections from touching the ground. When not in use the connections should be enclosed to prevent contact with dirt, soot, rain, etc. Hoses may be stored in a closed cabinet or special arrangement can be built.

The strainer is placed ahead of the pump to remove large pieces of rust and scale, or metal bits, etc. This protects the rest of the system from dangerous contamination. The filter, usually of the fiber, waste packed, or cellulose type, should be on the pressure side of the pump. A regular schedule for replacing the element should be adhered to. It may be desirable to use separate filters where one transfer system is used for both discharge and delivery. In case a very dirty delivery is made the filter may load excessively and some of the filtered material may be dissolved in the fuel and discharged to the fueling stations.

The location of the meter is dependent upon whether a quantitative check of deliveries is desired or not.

Water and solid impurities heavier than fuel will settle to the bottom of the tank and thus can be drawn off. The water discharge valve should always be located at the very lowest point, and nothing in the construction of the tank should hinder a free flow of water and precipitate to the discharge point. The discharge valve should be sufficiently large to pass any large particles of rust or scale. The importance of frequent water removal cannot be stressed too strongly.



Single Diesel oil transfer system for filling and discharging.

Since the tank is filled by pressure pump, the filling pipe should be at the same level as the discharge pipe or slightly higher. All splashing or cascading should be avoided when filling the tank. Excessive aeration during filling causes greater votalization, and the foaming that results may be undesirable.

It is not recommended that protective coatings be applied to the inside of the tank. Practically all paint-types are partly soluble in the fuel, although there has been some success with baked coatings. The fuel itself serves to protect the tank sides from rusting and it is good practice to keep the tank as full as possible to take advantage of this protection.

Tanks placed above the ground and subjected to severe winter cold below the pour point of the fuel require installations of heating coils to keep the fuel fluid. It is difficult to keep heating coils steam-tight or water-tight and they may contribute to water contamination.

It is important to check the performance of the filter during a particularly cold spell. Small crystal flakes of paraffin products precipitated from the fuel will quickly load the filter and cut off the flow or fuel.

Compressor Operation and Maintenance

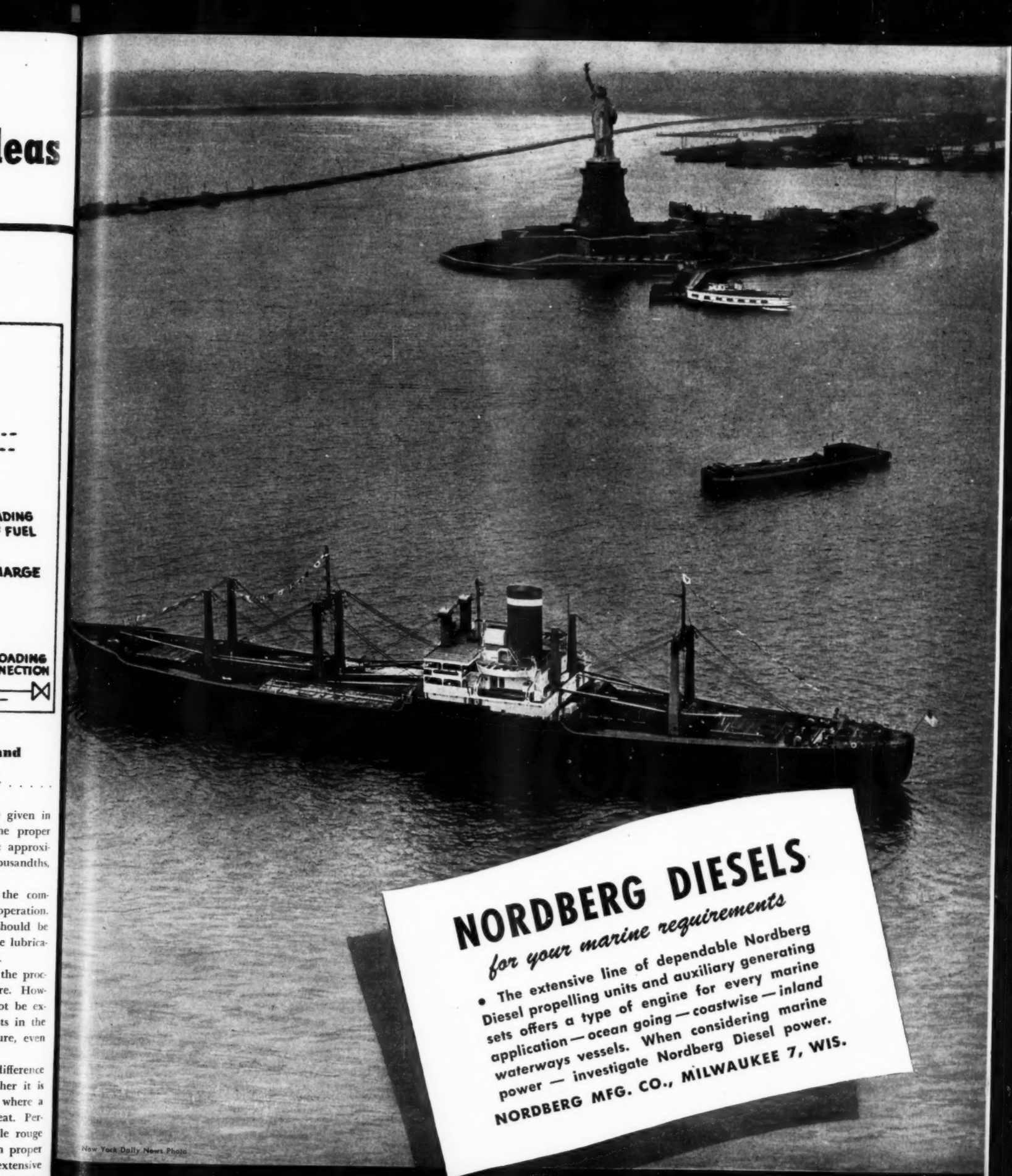
. . . . . *Continued from August issue* . . . . .

4. Valve lift: Care should always be given in assembling these valves to see that the proper valve lift is obtained. This should be approximately 1/8" plus or minus a few thousandths, minus being preferred.

5. Lubrication: The lubrication of the compressor is a vital point in satisfactory operation. Just the proper amount of lubricant should be used to give satisfactory results. Excessive lubrication is harmful as it tends to carbonize.

6. Moisture: The natural reaction of the process of compressing air is to form moisture. However in natural operation this should not be excessive. But any leaks around the gaskets in the cooling system is likely to admit moisture, even if these leaks are very small.

7. Lapping in valves: There is some difference of opinion among engineers as to whether it is necessary to lap valves to seats, that is, where a new valve is installed on an old valve seat. Personally the writer believes that if a little rouge is used and the valve seat has been given proper attention, it is not necessary to do any extensive lapping in. That is a point which must be decided by the workman doing the job. Some engineers prefer to lap in all valves installed.



New York Daily News Photo

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NORDBERG
DIESEL ENGINES

NORDBERG MACHINERY

"Scarlet Queen," *Continued from page 35* staterooms on the Port side each with basins; 1 on the starboard side and a cooks stateroom. The large Galley is equipped with large refrigerator, electric range and stainless steel sink, crews program radio and messtable capable of seating most of the crew at one sitting. A crew & Officer complement of 21 will be carried regularly.

A Separate room carries the 4-unit Baker refrigeration plant, each having 2 7¼ inch x 7¼ cylinders and powered by 50 Hp. Master motors and Cutler Hammer Controls. A small Baker unit driven by a 5 Hp. Westinghouse motor supplies the Galley Food Stores and a small Sterling unit the Galley box. An American Launry Machinery Machine is fitted for assisting the crew with their wash while at sea.

In the 2-level Engine room, a group of machine tools is fitted; a large switchboard; the Badger fresh water still; Heat exchangers for fresh water cooling of all Diesel engines and two 24 inch x 14 ft. starting air bottles; 2-7½ Hp. Gardner Denver air compressors with Cutler Hammer motor controls are fitted.

In the two level shaft alley, the lower part carries a fully covered propeller shaft extension to the Reduction gear aft, through a watertight bulkhead extending to the level of the grating in the upper shaft alley. On this lower level bait water mains and suction piping is provided along both sides. On the upper level the individual 5 Hp. Jacuzzi brine pumps and distribution valves for the refrigeration system are ranged along the inner faces of the insulated fish tanks.

No more elaborate layout of machinery has ever gone into a Tuna Clipper and this vessel is believed to have the largest Alternating Current auxiliary electric system ever fitted in a fishing vessel on the Pacific.

At top turns of the main diesel, with all tanks loaded to the limit so the ship rode deep in the water, speed was almost exactly 12 knots, or about one knot faster than the highest previous speed for Tuna Clippers.

The compact 2 cycle power plant, generating almost 3000 hp. at full speed & load is almost vibration free and there is little sound or hum transmitted to the fishing work area aft or to the pilot house and crows nest, vitally important on a Tuna ship.

"SCARLET QUEEN" left for her home port of San Diego June 19, and will fish for a subsidiary of French Sardine Co. Capt. Antonia Dutra is Master and Walter Burrus is Chief Engineer.

ATTENTION: Owners of General Motors, Detroit Diesel and Graymarine, Series "71" Diesel Engines

Here's your chance to stock up on brand new standard factory replacement parts for your engines at discounts as high as 83% off list.

Everything for your engine. From complete new engine units at $3000—to governor spring shims at 2½c each. Almost every part to keep your engine operating at top efficiency. Brand new Delco-Remy starters in original boxes, waterproof packed at $25 each, fuel transfer pumps at $13.50.

Write for complete list of genuine, new series "71" parts, TODAY.

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S.A.E. Joint Tractor and Diesel Engine Meeting

The first combined National Tractor and Diesel Engine Meeting of the Society of Automotive Engineers will be held September 7, 8 and 9 in the Hotel Schroeder, Milwaukee, Wis., John A. C. Warner, secretary and general manager of the Society announced.

Thirteen technical papers will be presented on research reports of diesel engine combustion, fuel compositions, cylinder and ring wear, transmissions, and engines of higher efficiencies, and C. G. A. Rosen, director of research of Caterpillar Tractor Co., Peoria, Ill., will speak on Future Powerplants for Tractors and Road Machinery at the dinner on September 9.

Among the engineers from abroad who will participate will be J. J. Broeze and C. Stillebroer, from the famed Delft Laboratories of the Royal Dutch Shell Co., The Netherlands. They will report on extensive research on fuels for high speed automotive and railroad diesel engines.

Both tractor and diesel engine subjects have been prominent on many of the Annual and Summer Meetings programs as well as in special SAE National Meetings devoted to these subjects, but this is the first joint meeting of these two SAE Engineering Activities.

Wheels of Progress

For many onlookers an aura of nostalgia surrounded this old horse car when it recently appeared in the gigantic New York At Work parade staged to mark the 50th anniversary of the incorporation of Greater New York. The horse car was followed, for contrast, by one of the latest Mack buses, 300 of which are replacing obsolete units in the city's transportation system. In the background is one of the famous 5th Avenue double-deckers, soon to join the horse car in complete retirement.

News OF THE INDUSTRY

Another Nordberg Diesel for Bermuda

Way back in February 1940, Rex W. Wadman, Editor and Publisher of DIESEL PROGRESS, reported on the installation of a Nordberg 3180 hp. diesel in the Bermuda Electric Light, Power & Traction Co., Ltd. plant. Mr. Wadman commented then that it was the first time an American diesel engine manufacturer had been able to get a foothold on this "tight little island." Now it may be reported that said manufacturer has both feet planted on the tight little island, Nordberg Mfg. Co. having recently landed an order for a 4250 hp. diesel with a 3000 kw. Westinghouse generator.

Socony-Vacuum Expands Fellowship Grants

Recognizing a need for still greater acceleration of the training of scientists, the Socony-Vacuum Oil Company, Inc., recently announced that it has appropriated $50,000 for a doubled program of fellowships in chemistry and physics at leading educational institutions.

In addition to 10 fellowships established last year and which are being continued, Socony-Vacuum officials said, at least 10 more will be established for the 1949-50 academic year at institutions which will be announced later.

The expanded fellowship program is in addition to a $250,000 grant announced recently by Socony-Vacuum to assist in basic studies of nuclear fission and its engineering at the Massachusetts Institute of Technology, Cambridge, Mass. It also supplements educational grants each year to two members of the company's research staff to enable them, without loss of income, to study for higher academic degrees at accredited universities of their own choice up to a period of three years.

The original 10 fellowships, carrying a stipend of $2,000 each, are being continued for the 1948-49 academic year at California Institute of Technology, Harvard, M.I.T., Notre Dame, Ohio State, Princeton, Rice Institute, Wisconsin, Illinois and Yale.

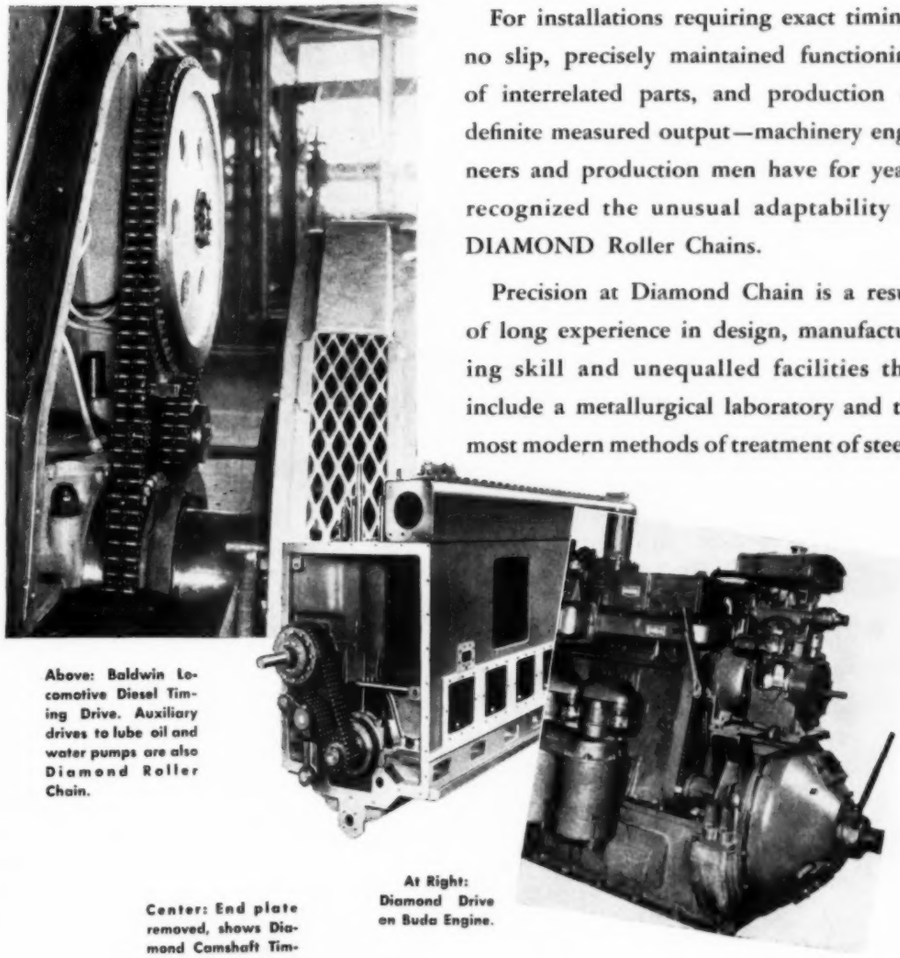
Recipients of the fellowships are selected by the universities from among students with at least one year of graduate work. No restrictions are placed by Socony-Vacuum on the recipients of the fellowships as to future employment nor as to publication of results of their investigations. Similarly, the recipients are free to study subjects other than ones connected with the petroleum industry.

In each case, a major portion of the fellowship stipends from Socony-Vacuum are paid to the students to assist in defraying their living costs.

THE JOHN S. BARNES CORP. has announced the appointment as its sales representative of Nielsen Hydraulic Equipment, Inc., 441 Lexington Avenue, New York 17, New York.

The Nielsen organization operates in the New York area. Its territory includes metropolitan New York and the eastern section of the state as far west as Utica.

Where Positive, Long-Life Drives Are Demanded



Above: Baldwin Locomotive Diesel Timing Drive. Auxiliary drives to lube oil and water pumps are also Diamond Roller Chain.

Center: End plate removed, shows Diamond Camshaft Timing Drive on Buckeye Model 80 Diesel.

At Right: Diamond Drive on Buda Engine.

For installations requiring exact timing, no slip, precisely maintained functioning of interrelated parts, and production of definite measured output—machinery engineers and production men have for years recognized the unusual adaptability of DIAMOND Roller Chains.

Precision at Diamond Chain is a result of long experience in design, manufacturing skill and unequalled facilities that include a metallurgical laboratory and the most modern methods of treatment of steels.

Diamond Roller Chain Drive; for timing from crankshaft to camshaft; also drive from crankshaft to pump shaft for the accessory drive.

Long years of performance have well demonstrated that where drives of lasting precision are demanded—Diamond Roller Chains do the job dependably. DIAMOND CHAIN COMPANY, Inc., Dept. 407, 402 Kentucky Avenue, Indianapolis 7, Indiana.

Offices and Distributors in All Principal Cities.

DIAMOND ROLLER CHAINS

THE BALDWIN LOCOMOTIVE WORKS has received an order for 10 diesel-electric switchers of 1000 hp. each from the Atchison Topeka & Santa Fe Railway System. Baldwin also has an order from the Union Railroad Company of Pittsburgh to build seven 1500 hp. diesel-electric transfer locomotives with six wheel trucks and six motors.

Power Show to Offer Equipment Designed for New Economies

THIS year's Power Show will reveal many ways to help check the inflation spiral at one of its numerous sources, as exhibitors emphasize equipment designed for new economies in the production, transmission and regulation of power. The big display, officially known as the 18th National Exposition of Power and Mechanical Engineering, will occupy four floors in Grand Central Palace, New York, November 29 to December 4.

Power demand is on the upgrade, with new plants accounting for a backlog of equipment orders running several years ahead, but the current need is pressing for means to step up existing plants and more especially to cut power costs wherever leaks can be plugged or higher efficiencies introduced. Devotion to these immediate and often urgent problems will constitute the theme of this year's exposition. New economies will be reflected in the long list of specialties, piping and valves, automatic recorders and controls, instruments for many purposes. Improved construction will be featured in pumps and compressors, fuel and materials handling equipment; variable transmissions and drives as well as many other kinds of power and power plant machinery.

The exposition is under the management of the International Exposition Company, Grand Central Palace, New York. Charles F. Roth is manager and E. K. Stevens, associate manager.

ACCELERATED RADAR SALES are rapidly lengthening the individual customer list compiled by Sperry Gyroscope Company, it was announced recently, by O. B. Whitaker, marine sales manager. Forty-eight separate domestic marine operators and thirty-six foreign customers comprise Sperry's current list, Mr. Whitaker stated.

Cooper-Bessemer President Indicates Compressor's Importance To Gas Supply

THE gas engine-driven compressor is currently the most important factor in the distribution of America's heating, cooking and industrial gas supply. So states Gordon Lefebvre, president and general manager of The Cooper-Bessemer Corporation, one of the nation's leading gas engine and compressor manufacturers.

While the shortage of steel pipe continues to be one of the major stumbling blocks to an appreciably increased gas supply, Mr. Lefebvre points out, compressors on existing cross-country lines are increasing the volume of gas to consumers to an important degree.

He cites as an example the tremendous job compressors are performing for the Texas Eastern Transmission Corporation, of Shreveport, La., since its acquisition of the Big Inch and Little Big Inch pipe lines.

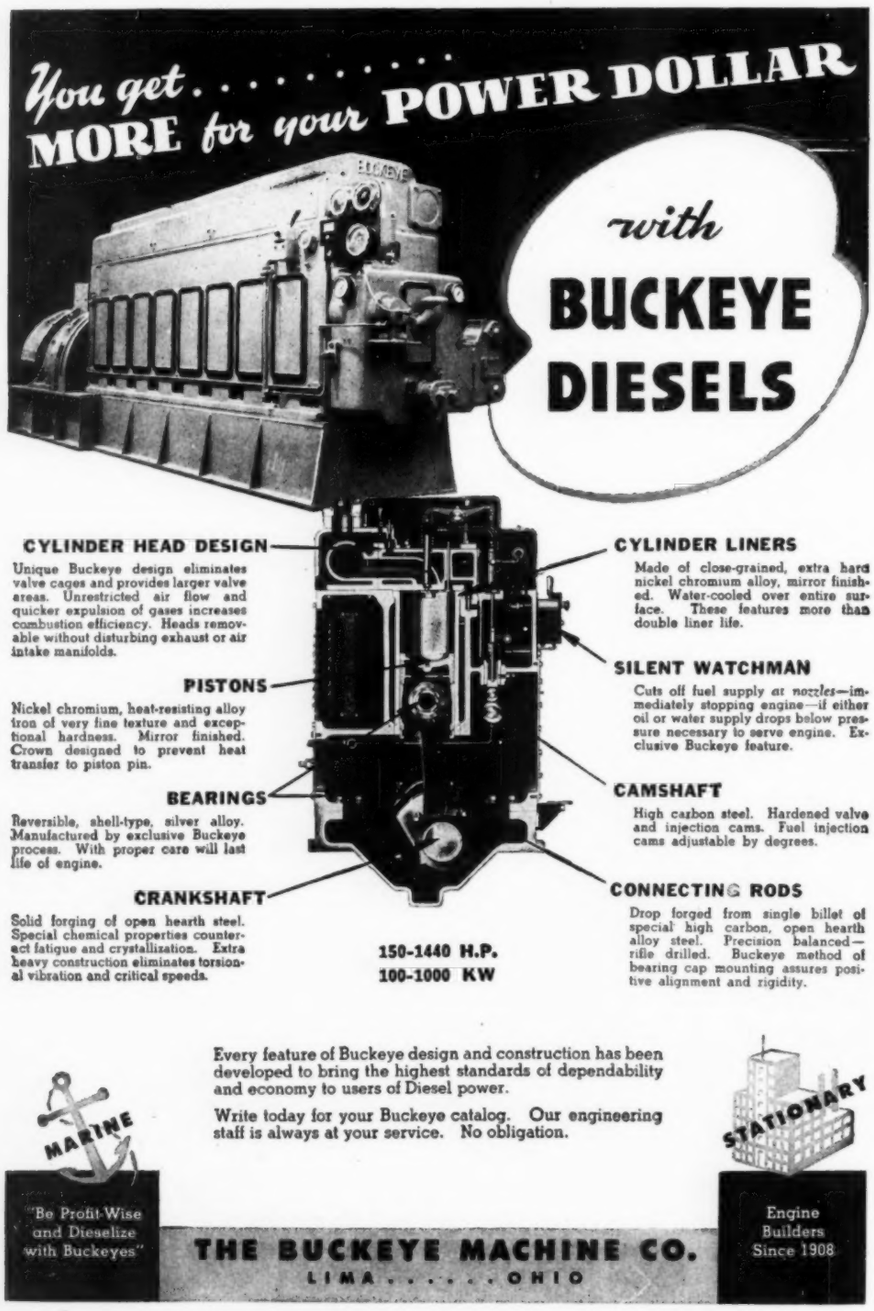
According to that company's recent annual report, the original volume of natural gas transmitted through these former Government-operated oil lines was approximately 140,000,000 cubic feet daily.

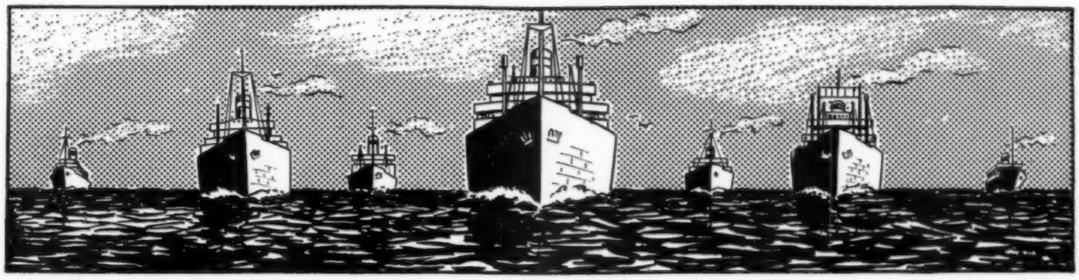
By December 31, of last year, compressor stations built along the 1254 miles of the Big Inch line and the 1479 mile Little Big Inch line had increased the gas volume to 433,000,000 cubic feet per day.

Texas Eastern is currently adding compressors to increase the daily volume to 508,000,000 cubic feet, or nearly four times the original supply to consumers.

Giant Power Barge Departs For South America

The Power Barge CREOLE #2142 recently completed at the Mississippi River Plant AVONDALE MARINE WAYS, INC., is seen departing New Orleans for South America in tow of the powerful sea-going diesel tug Eugenie M. Moran, July 14, 1948. This barge was built for the Creole Petroleum Corporation, subsidiary of the Esso Standard Oil Company. The non-self propelled barge 174' x 70' 12', has all diesel powered machinery necessary for drilling off-shore oil wells. She is to be used in Lake Maricaibo, off Venezuela.





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The American Merchant Marine Looks Ahead!

THE American Merchant Marine Conference, sponsored by The Propeller Club of the United States in conjunction with its Twenty-Second Annual Convention, will be held in New York, October 13, 14 and 15th, 1948.

The Conference theme will be "The American Merchant Marine Looks Ahead!" Problems of vital concern to the American Marine Industry growing out of the period of world reconstruction and the rehabilitation of our domestic and foreign trade will be presented and discussed by recognized authorities. The Conference will concentrate the experience and wisdom of outstanding leadership upon subjects of utmost importance affecting the future of the American Merchant Marine.

Panel Discussion meetings will be held on October 13, 14 and 15th; the American Merchant Marine Conference Luncheon and Session on Thursday, October 14th; Propeller Club Convention Session on Friday, October 15th; and on the evening of that date, the annual American Merchant Marine Conference Banquet.

The necessity for constructive and coordinated effort is more apparent today than ever before. . . Your cooperation and participation are needed in this program to foster the best interests of the American Merchant Marine as an essential factor in the national defense and our economic welfare. . . Arrange now to attend the American Merchant Marine Conference and to take part in this important annual gathering of the American Marine Industry.

AMERICAN MERCHANT MARINE CONFERENCE

THE WALDORF-ASTORIA – NEW YORK

October 13, 14 and 15th, 1948

For Complete Details and Advance Program, Address

The Propeller Club of the United States

National Headquarters

17 Battery Place - New York 4, N. Y.

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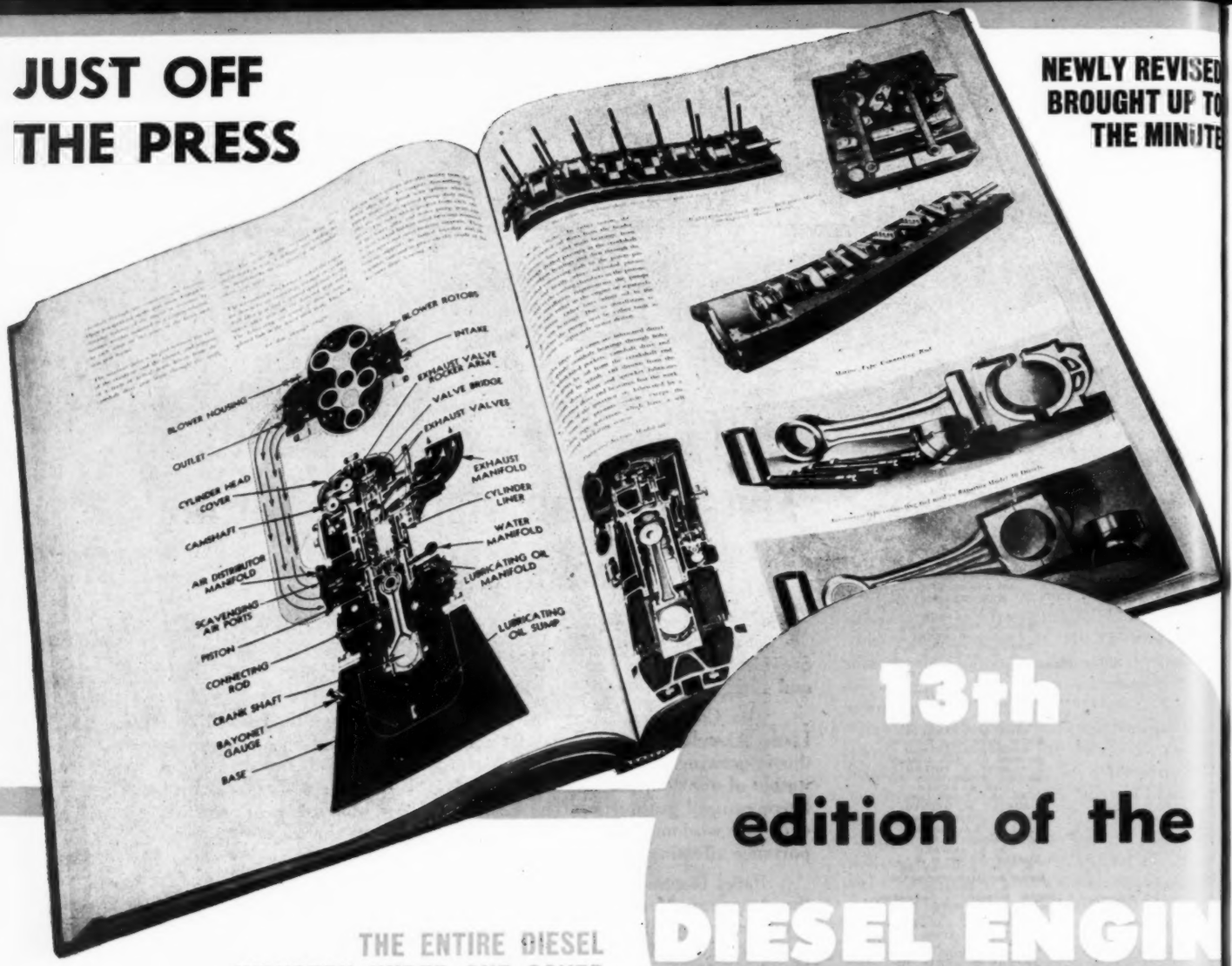
NEWLY REVISED
BROUGHT UP TO
THE MINUTE



13th edition of the DIESEL ENGINE CATALOG

THE ENTIRE DIESEL INDUSTRY UNDER ONE COVER

Whatever you are looking for in diesel engines, or accessories, you will find them described and illustrated in the 1948 DIESEL ENGINE CATALOG, Volume 13, edited by Rex W. Wadman. What's more, you will find complete specifications on

840 DIFFERENT MODELS

The Products of 53 Engine Manufacturers. Each engine description is complete and accurate—checked and double-checked by the Manufacturer himself. Illustrations include full page engine views, lube and fuel system diagrams, also cooling systems—many traced in color. But that is just the Diesel engine section. The Catalog also includes an accessory section carrying valuable information on the various Fuel Injection Sytems, Gear and Chain Drives, Turbochargers, Blowers, all fully described and profusely illustrated.

FOR DESIGN AND OPERATING ENGINEERS AND BUYERS

There is a Market Place Section—a directory of Diesel engines classified as to ratings and speeds with manufacturers' names and addresses—and a Product Directory including accessories, parts, materials and services—all classified as to products. The Market Place tells you at a glance where to find what you want for your engine or plant.

NO OTHER DIESEL BOOK LIKE IT
Really 4 Books In One

1. **The main section is devoted to descriptions, illustrations and specifica of all the Diesel engines manufactured in this Country.**
2. **A large section carries complete illustrated descriptions of Diesel en and plant accessories.**
3. **The Market Place—a classified directory of Diesel Engines and Access**
4. **Manufacturers' Advertisements—informative—helpful.**

REVISED ANNUALLY

The most widely-used Diesel reference book published:—Because the bo revised and brought up to the minute each year, thousands of design operating engineers, purchasing and sales executives, Diesel students buy DIESEL ENGINE CATALOG each year and constantly refer to it thro out the year. The 1948 Edition, Volume 13, embodies sweeping chan es— models and types, revised designs, and carries the basic information publi in previous editions. Whatever your interest in Diesels is you will find Edition of the DIESEL ENGINE CATALOG indispensable.

DIESEL ENGINE CATALOG
Two West Forty-Fifth Street, New York 19, N. Y.

Enter my order today for a copy of the 1948 Diesel Engine Catalog, Volume Thirteen, Edited by Rex W. Wadman, for which I enclose $10.00, also payable at £2-9-7 to E. H. Doddrell, 10 Bury Street, St. James's, London S.W.1.

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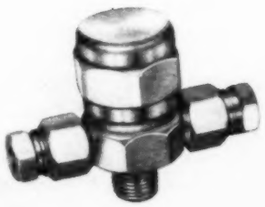


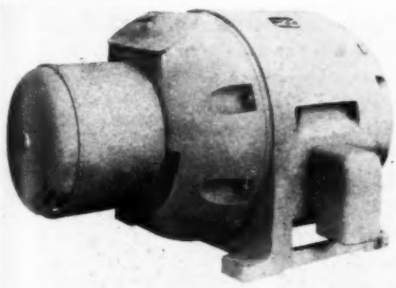
Grannan lubricator

A NEW LUBRICATOR VALVE that delivers a positive metered amount of oil or grease to each bearing in lubricating systems has just been announced by Titeflex, Inc.

Known as the Grannan Lubricator, it dispenses all lubricants from light oil to heavy greases through the same valve without alteration. It is a fully hydraulic, through flow valve, with no pockets or crevices to retard lubrication. The valve is completely enclosed to prevent leakage and to eliminate possibility of contamination to the lubricant from outside sources. The Grannan Lubricator is installed directly into the bearing. It does not require special guns to introduce lubricant to system. The lubricator will function either with hand operated guns or from a completely automatic system set to operate at any desired interval.

For further information write Titeflex, Inc., 524 Frelinghuysen Ave., Newark 5, N. J.

New Line of G-E Tri-Clad High Speed Synchronous Motors and Generators



G-E "Tri-Clad" Synchronous AC Generator with direct-connected exciter.

A new line of general purpose, TRI-CLAD, high speed synchronous motors and generators in "900 series" frame sizes, has been announced by the Large Motors and Generators Divisions of the General Electric Company.

The new motors are available in standard ratings from 20-hp. to 1,000-hp. at 60 cycle speeds of 514 to 1800 rpm., in either two-phase or three-phase types. Generators are available in ratings from 12½ to 1250 kva.

Of drip proof construction, the motors incorporate the usual TRI-CLAD features. Direct-connected and belt-driven exciters are available for all ratings.

Additional information concerning the motors is available in bulletin GEA-5113, and the generators in bulletin GEA-5125, obtainable from General Electric Company, 1 River Road, Schenectady, New York.

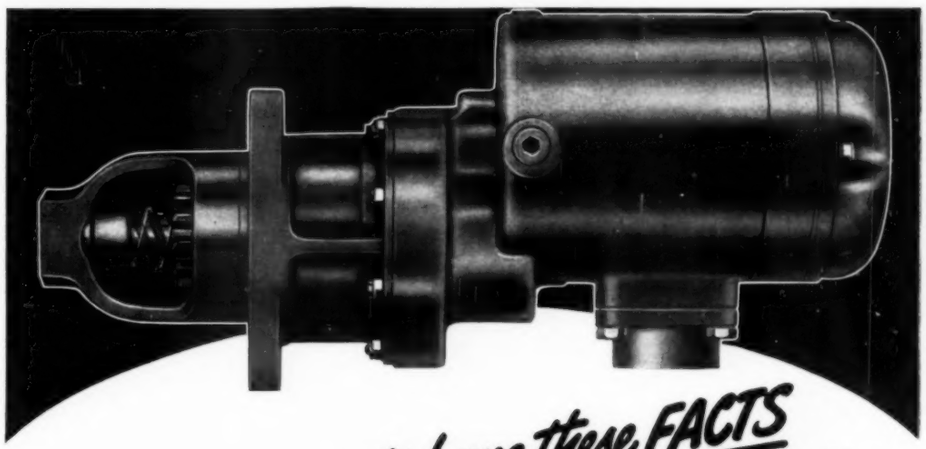
New Cooler Assures Simple Maintenance

THE GRAHAM Monobolt Cooler brings to the industry a solution for one of the problems faced by diesel operating engineers, that of cleaning water and lube coolers. This new cooler incorporates, as one of its features a tube bundle which

Graham monobolt cooler

can be removed from the shell by loosening one heavy bolt. In a matter of minutes the whole cooler can be disassembled, ready for cleaning or inspection.

The Graham Monobolt utilizes a full floating head which is free to move and compensate for any differential temperature expansion between the tubes and shell. Leakage from tube to shell



It will pay you to have these FACTS on the NEW

LEECE·NEVILLE

AIR CRANKING MOTOR

for starting Diesel and Gasoline Engines

PERFORMANCE DATA

Air Pressure p. s. i.	Maximum Dev. H. P.	Pinion R. P. M. (Approx.)	Air Consumption c. f. m.
100	10	3000	250
150	15	3000	400
200	20	3000	550

Variable factors control motor application. Under normal cranking conditions one motor may crank engines up to 1000 or more cu. in. displacement. Two motors may be used for larger engines.

AIR CAPACITY REQUIREMENTS

A 20 cu. ft. storage tank at not less than 150 p.s.i. should give about 30 seconds cranking. This varies with engine size and temperature. Maximum permissible pressure 250 p.s.i. For cranking at temperatures near freezing it is desirable to have pressure of not less than 100 p.s.i. and an adequate supply of air.

● The Leece-Neville Air Cranking Motor for absolutely *safe* starting of Diesel and gasoline engines brings you outstanding *economy, dependability* and *long-term satisfaction.* Advanced engineering has provided six built-in advantages of vital importance to assure superior performance. Write today for bulletin which describes these and gives many other facts it will pay you to have. *The Leece-Neville Company, Cleveland 14, Ohio.*

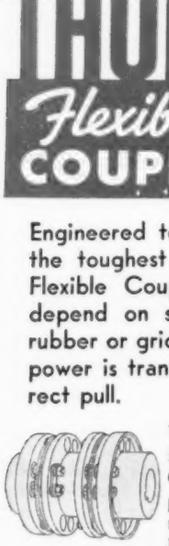
LEECE-NEVILLE

Pioneer and STILL Quality Leader

CRANKING MOTORS • GENERATORS • VOLTAGE REGULATORS • SWITCHES

THOMAS
Flexible ALL METAL
COUPLINGS

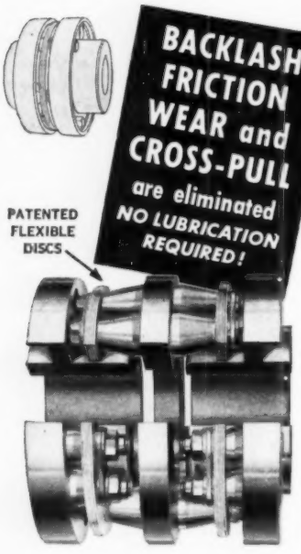
Engineered to stand up on the toughest jobs, Thomas Flexible Couplings do not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.



The standard line of Thomas Couplings meets practically all requirements. But if unusual conditions exist we are equipped to engineer and build special couplings.

BACKLASH FRICTION WEAR and CROSS-PULL are eliminated
NO LUBRICATION REQUIRED!

PATENTED FLEXIBLE DISCS



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

Write for New Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

side is prevented by a Muntz metal gland ring and heavy asbestos graphite packing rings. The tubes are of Admiralty metal. The shell is fabricated of seamless steel. The tube baffles are steel and are machined for a close fit to the shell. The cover connections are placed at right angles to the cooler so that the tube bundle may be withdrawn without removing long sections of piping.

Standard Graham units of both the single and double pass type are designed for 60 psi. and tested to 90 psi on both sides. The design temperature is 300° F. These compact units are suitable for cooling all types of diesel engines. For further information write Graham Manufacturing Co., 415 Lexington Ave., New York 17, N. Y.

Names IN THE NEWS

Sharples Advances Keady

At a recent meeting of the Board of Directors of The Sharples Corporation G. Joseph Keady, Executive Vice President was elected President of the Corporation. Philip T. Sharples, President, became Chairman of the Board.

G. J. Keady

The company's business is development and invention of chemical processes for practically every industry, and the manufacture of equipment, mainly high speed centrifuges, for the operation of those processes.

The Sharples Corporation's principal plant is in Philadelphia. In London, England there is a wholly owned subsidiary, Sharples Centrifuges Limited, and in Paris, France there is a wholly owned subsidiary, Societe Anonyme Des Appareils Centrifuges. Sales offices are located in principal cities in the United States and agencies for the sale of Sharples products are located in 26 foreign countries.

Personnel Changes at Caterpillar

R. V. BRADLEY has been named a member of the Sales Development Division of Caterpillar Tractor Co., Peoria, Illinois, as a Special engine sales representative, according to an announcement made by C. E. Jones, Sales Development Manager.

Bradley, a District Representative serving the Central Division since 1946, joined "Caterpillar" in 1927 as an electrician and has worked in the engineering laboratory and as a service representative. During World War II he was contracted by Pan American Airways, at the request of the U. S. Government, for work in South America for the U. S. Army and U. S. Navy.

Coincident with the announcement, F. D. Haberkorn, "Caterpillar" Central Sales Manager, has named J. M. Abbey to serve Minneapolis and Central Canada, contacting distributors and agricultural dealers in Bradley's former territory.

Abbey, a graduate of the University of Illinois School of Commerce, has been associated with "Caterpillar" since 1936. Since 1946 he has served as District Representative in contacts with distributors in New Mexico and West Texas.

C. D. Ashby has been named to succeed Abbey and will contact distributors formerly contacted by Abbey.

Ashby, a graduate of the "Caterpillar" four-year machinist apprentice training course, has served as a foreman in the factory and has held positions in the Industrial Relations, Merchandise and General Sales Departments.

J. K. Tibbetts, a District Representative since 1944 contacting distributors in Wyoming, Nebraska and Colorado, has resigned to accept a position with Held & McCoy Machinery Co., "Caterpillar" distributor at Denver, Colorado.

Harold T. Anderson Promoted At Worthington

The Worthington Pump and Machinery Corporation recently announced the appointment of Harold T. Anderson as assistant to the General Sales Manager, in charge of Sales Production Relations.

H. T. Anderson

Mr. Anderson is responsible for receiving and interviewing representatives of customers' organizations who visit the Harrison Works seeking current information with respect to production schedules of specific orders. It is expected that this newly created office will provide a smoother channel for expediting, and advance the overall customer-relations program.

Alco Appoints John Thomas and William G. Miller

APPOINTMENTS OF John Thomas as manager of the American Locomotive Company's Locomotive Division and of William G. Miller as manager of the company's Auburn, N. Y., plant were announced recently by P. T. Egbert, vice-president in charge of the division. Thomas will take charge of engineering, purchasing, service, renewal parts and inspection phases of the locomotive division and, in addition will continue to supervise manufacturing departments of the locomotive division that are located in Auburn.

Miller transferred from Schenectady to the Auburn plant as assistant to the manager in March 1948. He previously had been assistant to Vice President Egbert at Schenectady for three years.

C. B. MURPHY, widely known diesel sales engineer, has been appointed by Lima-Hamilton Corporation, to represent the firm in the sale of diesel engines and power engineering equipment in the Southwest. With headquarters at 3130 Daniels Street, Dallas, Mr. Murphy will represent Lima-Hamilton in covering all power projects, including oil fields and pipeline work, in the Southwest. His telephone in Dallas is Justin 8-1611.

National Supply Appoints Wren Malone

Appointment of Wren Malone as manager of the Springfield region has been announced by Robert M. Pearson, sales manager of the Superior Engine Division of The National Supply Company. Mr. Malone's headquarters will be at Springfield, Ohio. He succeeds E. D. Cahill, who has been assigned other duties in the Springfield Sales Department. In addition to handling sales of Superior marine and stationary engines in the Springfield region, Mr. Malone will have charge of inland waterway sales on the Ohio River and its tributaries between Pittsburgh and Cairo, and on the Mississippi and its tributaries as far south as and including Memphis, Tenn. Mr. Malone has worked in the Superior Engine Division's office in Springfield for the past four years.

Nordberg Appoints W. W. McCamon

The appointment of W. W. McCamon as sales engineer, for both Marine and Stationary Diesel engines, is announced by R. W. Bayerlein, Vice-president, Heavy Machinery Division, Nordberg Mfg. Co., Milwaukee, Wisconsin.

W. W. McCamon

Mr. McCamon received his introduction to the diesel engine field with Hudson Bay Company's first trading activity in the Western Arctic 25 years ago. In 1924 he joined Atlas Imperial Diesel Engine Co. where he did testing, erecting and field service work on marine and excavating machinery engines. He left Atlas Imperial in 1931 and rejoined that company in 1943 as Central Division Manager with offices in Chicago. He was in charge of stationary, industrial, marine and manufacturer installations.

Between 1931 and 1943 McCamon did sales engineering work in the food processing and refrigeration industries and taught diesel engine courses for the U. S. Navy.

Sealed Power Names New Officers

Paul C. Johnson

AT a meeting of the Board of Directors of Sealed Power Corporation recently, Paul C. Johnson was named executive vice president to succeed Neil A. Moore who resigned as vice president and general manager. R. R. Beardsley was named vice president and secretary. L. G. Matthews was named treasurer. C. E. Johnson continues as president, a post he has held since the founding of the corporation in 1911.

Johnson has been vice president in charge of sales since 1941 and has been with Sealed Power since 1929.

CROCKER WHEELER MFG. CO., a division of the Joshua Hendy Corporation recently announced the appointment of Ralph S. Drummond as Manager of the Cincinnati branch office.

CARL HAMILTON, Sales Manager of Perfect Circle Corporation, recently announced the appointment of A. J. Weigand as Fleet Sales Engineer.

E. L. BEHRENDS recently joined the General Sales Department of the Taylor Forge & Pipe Works.

THE C. LEE COOK Manufacturing Company recently announced the appointment of M. A. Boulden to its Sales-engineering staff.

THE RETIREMENT of Ernest Kuehn, Pacific Coast Regional Manager of Electro-Motive Division of General Motors was announced recently. C. A. Bercaw will succeed him. George W. Rukgaber will succeed Mr. Bercaw as District Sales Manager of the Chicago region.

Get EXTRA Diesel Power With a BETTER Diesel Motor Oil — D-X

Yes, it takes an oil like D-X Diesel Motor Oil to keep Diesels from getting that "tired feeling" just when you need extra power to get the job done.

D-X Diesel Motor Oil keeps Diesels running at peak efficiency. Its high detergent action keeps engines cleaner. Its high film strength and high resistance to heat and oxidation provide extra lubrication protection. It's non-corrosive — safe for all types of alloy bearings. And it's highly resistant to the formation of power-stealing sludge.

D-X is the choice of thousands of operators of Diesel engines in trucks, buses, tractors, marine and stationary installations. It is approved by manufacturers of these engines. And it is guaranteed! You can prove D-X Diesel Motor Oil's superiority for yourself and get your money back if you're not satisfied. Write the D-X office nearest you for prices and terms.

Buy these great products

D-X Hi-Speed Diesel Fuel
D-X Regular Diesel Fuel

●

DIAMOND DIESEL MOTOR OIL
— an efficient, economical Diesel Motor Oil for low speed engines.

MID-CONTINENT PETROLEUM CORPORATION
TULSA, OKLAHOMA

Waterloo, Ia. Terre Haute, Ind. Chicago, Ill. Omaha, Nebr.

ROBERT L. MOOG has been appointed eastern division manager for the Geo. D. Roper Corporation Pump Division. Lester B. Hyde, former division manager has retired from active business.

ANCHOR POST PRODUCTS announced recently the appointment of K. B. Olson, Harold E. Stanton, and W. S. Howland as district marine heater sales representatives.

Davies Named Sealed Power Sales Manager

PAUL C. JOHNSON, Executive Vice President of Sealed Power Corporation, announces the appointment of George W. Davies as General Sales Manager. Prior to assuming these duties he was Sales Manager in charge of the Original Equipment Piston Ring Division. He has been in the employ of the company for the past fourteen years.•

Miller New Sales Manager of Adel

Wm. DeRidder, president of Adel Precision Products Corp., Burbank, California, recently announced the appointment of Fred T. Miller to the position of sales manager of the firm. Mr. Miller has been associated with Adel for seven years, and prior to his present position was the firm's west coast sales representative. In this capacity he supervised the supplying of Adel Precision Products to the aircraft industry, and marine and industrial fields in Western United States.

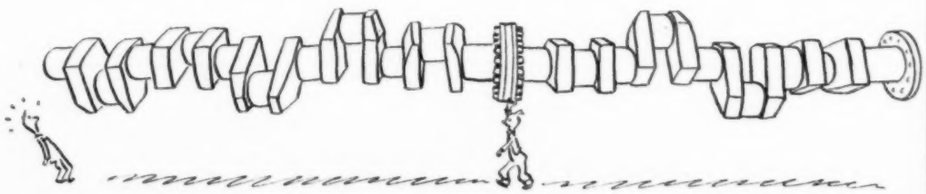
Engineering Societies Meetings Scheduled

S.A.E. National Meetings

Tractor and Diesel Engine	Hotel Schroeder	Milwaukee, Wisc.	Sept. 7-9
Aeronautic Meeting and Aircraft Display	The Biltmore	Los Angeles, Cal.	Oct. 6-9
Production Meeting and Clinic	Statler Hotel	Cleveland, O.	Oct. 21-22
Fuels and Lubricants	The Mayo	Tulsa, Okla.	Nov. 4-5
	1949		
Annual Meeting and Engineering Display	Book-Cadillac Hotel	Detroit, Mich.	Jan. 10-14
Passenger Car, Body and Production Meeting	Book-Cadillac Hotel	Detroit, Mich.	March 8-10
Transportation Meeting	Statler Hotel	Cleveland, O.	March 28-30
Aeronautic and Air Transport Meeting	Hotel New Yorker	New York, N. Y.	April 11-13
Summer Meeting	French Lick Springs Hotel	French Lick, Ind.	June 5-10
West Coast Meeting	Multnomah Hotel	Portland, Ore.	August 17-19
Tractor (possibly diesel)		Milwaukee, Wisc.	September

A. S. M. E. National Meetings

Fall Meeting	Reed College	Portland, Ore.	Sept. 7-9
Annual Meeting	Hotel Pennsylvania	New York, N. Y.	Nov. 28-Dec.
	1949		
Spring Meeting		New London, Conn.	May 2-4
Semi-Annual		San Francisco, Cal.	June 27-30
Fall Meeting		Erie, Pa.	Sept. 28-30
Annual Meeting	Hotel Pennsylvania	New York, N. Y.	Nov. 27-Dec.



THE MODERN LUBE OIL AND JACKET WATER COOLER—**GRAHAM MONOBOLT**

A compact and highly efficient cooler recommended for all engine services.
Graham Monobolt coolers may be disassembled for cleaning or inspection in a matter of minutes; they incorporate many other improvements in construction details that result in a top-notch cooler.
Deliveries are good and prices are competitive.
Ask for leaflet MP-119 for full details.

GRAHAM MANUFACTURING CO., INC. 415 Lexington Ave., New York 17,N.Y.

Diesel Yacht THERESA

Diesel 56-foot *Theresa* cruising at 18 mph.

THE yacht *Theresa*, designed and built by the Consolidated Shipbuilding Corporation, City Island, New York, is a 56 ft. cruiser with a beam of 13 ft. 6 in. and a draft of 3 ft. 10 in. It was designed for family cruising and for comfortable living aboard. The accommodations are for eight in the owner's quarters and for two in the crew's quarters.

The hull is double planked with Mexican mahogany fastened throughout with Everdur screws. The trunk cabin and shelter sides are solid Mexican mahogany. The salon is fitted with a sliding door on the starboard side while the windows are the Consolidated clutch type. Side decks, forward decks, lounging deck and cockpit deck are all teak.

The *Theresa* is powered with two 200 hp. General Motors Diesel engines equipped with hydraulic controls. The reduction gear is 2:1 for a vessel speed of 18 mph. Each engine is equipped with a 900 watt generator. Additional engine room equipment includes the following: one auxiliary Diesel generator (4 cycle, 32 volt), an Eco ½ hp. electric driven all bronze bilge pump, a Delco automatic water pressure set (250 gallons per hour), two sets of 32 volt Exide batteries, one 125 lb. Lux fire protection system manually operated. The engine and throttle controls are Kimball. Engine room is completely sound-proof.

Starting at the forward end, the forward deck has an Ideal electric windlass. Going aft, the salon is finished in conventional mahogany with a primavera ceiling. Upholstering and carpeting are predominantly blue. On the lounging bridge, across the after end, is an upholstered seat covered with blue Koroseal while on the forward end, port side, is the entrance to the engine room. Below and forward, are the crew's quarters. Next, aft, is the galley which contains a refrigerator and deep freeze with a separate Frigidaire compressor serving each. Here also is located a Shipmate four-burner stove with oven underneath, a Shipmate hot water heater and a Shipmate specially designed grille for warming. The galley is completely insulated with asbestos covered by stainless steel and has exhaust blowers connected to all hoods. Another unusual feature located in the galley is the gas hot water heater which is used exclusively for cabin heating. This arrangement has been made so that the owner suffers no noise or discomfort by having an auxiliary generator running during sleeping hours. Aft of the engine room is the guest stateroom which constitutes an upper and lower berth.

This yacht is equipped with a Hudson-American ship-to-shore Mariner telephone, an R.C.A. radio direction finder, a submarine signal fathometer, a ½ mile-ray searchlight, and all other legal equipment necessary.

Just Out

Supercharging The Internal Combustion Engine

By E. T. Vincent
Professor of Mechanical Engineering
University of Michigan

323 pages, 6 x 9, 167 illustrations, $5.00

This book contains the essential fundamental theory of the various forms of superchargers and turbo-superchargers, together with a treatment of their effects on engine cycles, power outputs, and thermal efficiencies. The emphasis is on the fundamentals of the thermodynamics and mathematics involved in solving problems of supercharging.

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Please send me a copy of Vincent—SUPERCHARGING THE INTERNAL COMBUSTION ENGINE for 10 days' examination on approval. In 10 days, I will remit $5.00, plus few cents postage, or return book postpaid.

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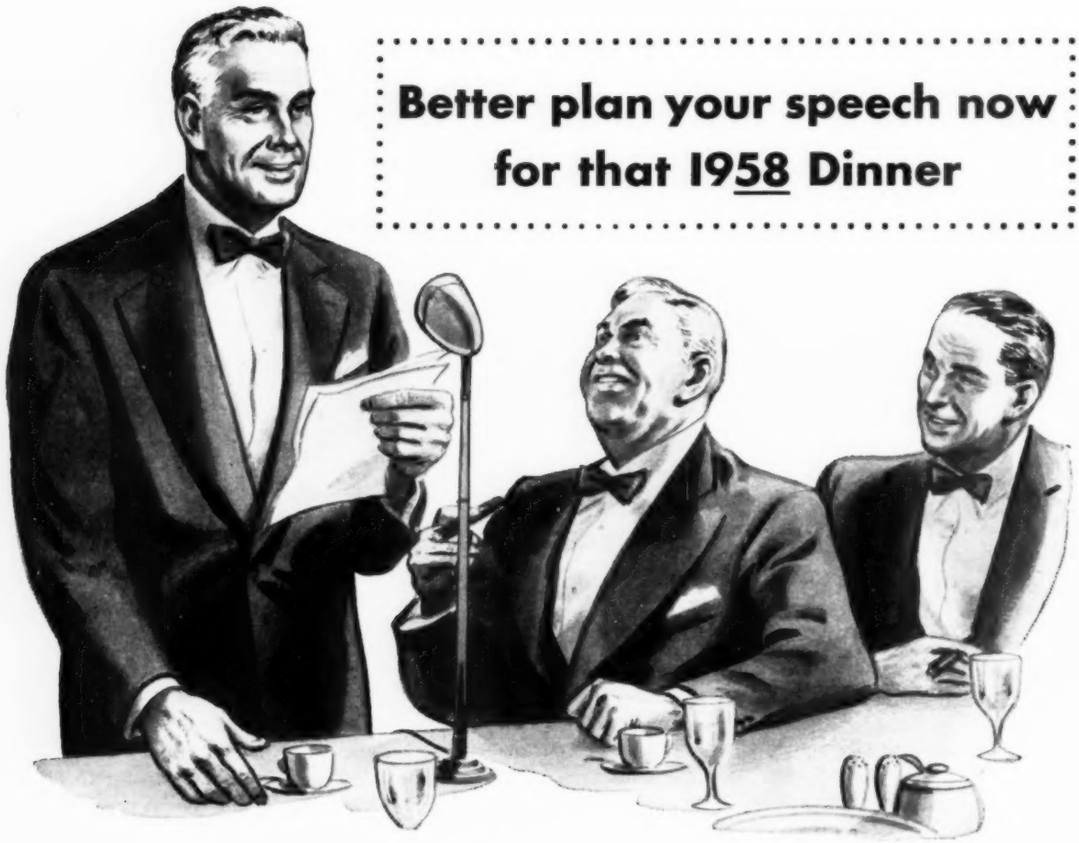


Better plan your speech now for that 1958 Dinner

Ten years can be a mighty short span in the history of a business. *Yours* for example.

When the time comes to address your fellow executives at the "Annual Banquet" in 1958, will there be a decade of outstanding company progress for you to review?

One way to make sure of a prospering business tomorrow is to make certain *today* that your employees are buying U.S. Security Bonds regularly—on the Payroll Savings Plan. The Payroll Savings Plan is a "look-ahead" plan for both management and employees. It builds up an employee group with a sense of extra security...with a tangible stake in the nation's future...a group bound to shun dollar-destroying philosophies. At maturity, the Bonds pay $4 for every $3 invested.

P.S.P. is paying off *today*, for every Security Bond dollar built up in the Treasury retires a dollar of the national debt that is potentially inflationary. Records of the companies that actively maintain the Payroll Savings Plan show improved employee attitudes. Absenteeism and accidents have dropped as the individual's feeling of security grows with regular Bond buying.

The whole plan of action for use within your company has been mapped out. Just call your Treasury Department's State Director, Savings Bond Division.

The Treasury Department acknowledges with appreciation the publication of this message by

R. F. Wadman

Editor—DIESEL PROGRESS

This is an official U.S. Treasury advertisement prepared under the auspices of the Treasury Department and the Advertising Council.

New Books AND BULLETINS

THE 30TH ANNIVERSARY ISSUE of *Production Road,* published by the Twin Disc Clutch Company celebrates the founding of the company in the days when the power transmission equipment industry was in its infancy. The booklet traces through the development of power equipment up to and including the present with an interesting selection of drawings and photographs contrasting the old with the new, in this fast developing field of power transmission.

STRESSING the increasing importance and uses of diesels in the petroleum industry, Caterpillar Tractor Co. has issued an eight-page two-color booklet devoted to *Pipeline Pumping With Caterpillar."*

Among the applications highlighted in this booklet is the use of the "Caterpillar" dual-fuel attachment for low cost operation on natural gas in areas where stripped natural gas is plentiful.

Copies of *Pipeline Pumping With "Caterpillar"* may be secured from Caterpillar Tractor Co., Peoria 8, Illinois by requesting Form No. 11459.

A NEW BULLETIN recently published by the Mines Equipment Company illustrates and describes the company's standard line of Molded Neoprene Rubber Electrical Connectors and associated equipment. These products are important accessories for diesel electric and electric equipment especially if the equipment is used in exposed places. For copies of this bulletin write Mines Equipment Company, Dept. 10, 4215 Clayton Ave., St. Louis 10, Mo.

COOPER-BESSEMER PRODUCTS, a new folder recently issued by the Cooper-Bessemer Corporation illustrates and describes briefly the complete line of the company's products which range from a small gas engine compressor unit to the big Type LS supercharged diesel engine developing 1810 hp. at 360 rpm. Also included are the complete line of pumps and compressors. For copies of this folder write the Cooper-Bessemer Corporation, Mount Vernon, Ohio.

ELECTRIC HAND TACHOMETERS and accessories are the subject of a new bulletin recently issued by the Metron Instrument Company. Available in 2 different types—one for 200-10,000 rpm. range the other for 20-1000 rpm, these instruments have a sustained accuracy of 1%. For copies of this bulletin write Metron Instrument Company, 432 Lincoln St., Denver 9, Colorado, for bulletin No. 103.

A. C. MOTORS—New 20 page publication E-M Synchronizer No. 24 contains valuable information on "Motors . . . how they help produce and preserve food," "Coil Insulation for Large A-C Motors . . . new materials and methods," and "High Inertia Loads . . . their motor requirements." Published by Electric Machinery Mfg. Company, Minneapolis 13, Minnesota.

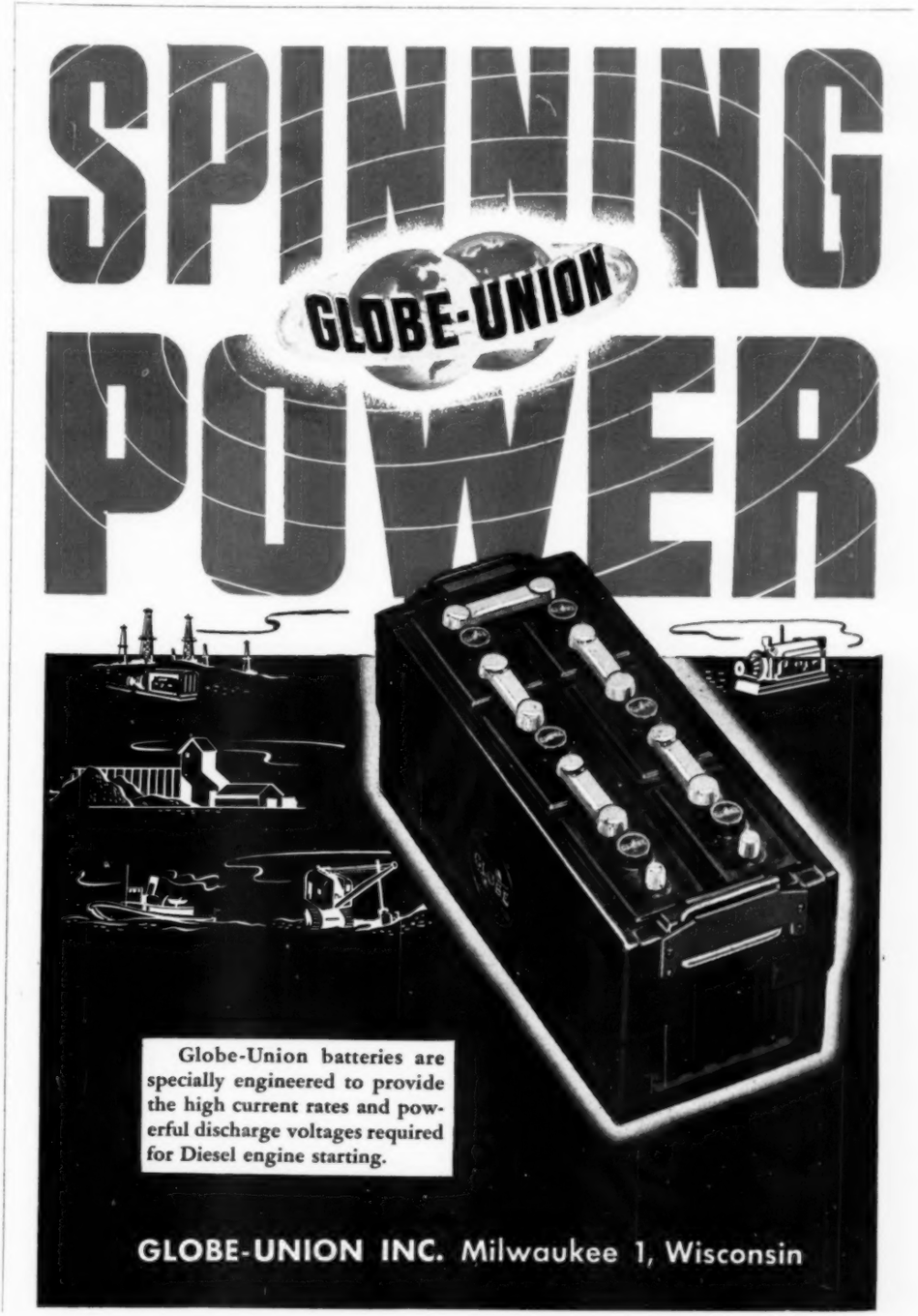
FOR THE FIRST TIME, De Laval Steam Turbine Company single stage pumps have been included in a single comprehensive catalog presenting outstanding features of De Laval design and construction, listing pump ratings and incorporating essential dimensions. With this catalog, engineers can select the required pump, estimate motor size and plan approximate installation dimensions.

In replacing several separate leaflets for these pumps, the one catalog now contains information for all G, I, K, L, M and P single stage, single and double suction pumps. The catalog also gives brief descriptions of such optional features as mechanical shaft seals, self-priming systems and vertical mountings. Bulletin No. 83-29, De Laval Steam Turbine Company, Trenton 2, New Jersey.

SUPERIOR DIESEL DRILLING Engines, including engines with dual fuel equipment, are described and illustrated in a new 20-page bulletin, No. 318-A. These are naturally-aspirated 6- and 8-cylinder engines with 8½-in. bore and 10½-in. stroke, rated at 300 and 400 hp. respectively at 900 rpm. for continuous operation. Copies are available from The National Supply Company, Box 899A, Toledo, Ohio.

INDUSTRIAL USES FOR "CATERPILLAR" DIESELS is the title of a recent publication of Caterpillar Tractor Co. This 16-page, two-color booklet deals with the functional efficiency of track-type tractors, diesel engines, and diesel electric sets operating both as prime and auxiliary units in industries throughout the world.

Copies of this bulletin may be secured from Caterpillar Tractor Co., Peoria 8, Illinois by requesting Form 11620.



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in Reducing Fuel and Repair Costs

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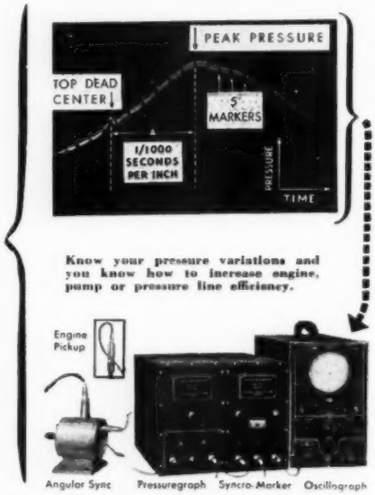
Reveals basic facts heretofore unknown!

Solves many problems by reproducing on oscillograph screen an accurate picture of explosion or pressure variations related to factors of time, angular velocity, peak and top dead center pressures, crank shaft, carburetor and exhaust actions, etc.

Quickly pays for itself in operation and maintenance savings. Now used by leading engine, aircraft and automobile manufacturers, oil companies, chemical plants and refineries, military and naval ordnance, etc.



Know your pressure variations and you know how to increase engine, pump or pressure line efficiency.

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Whatever your special problems consultation with our engineers is cordially invited.

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GENERATORS AC and DC

Well-known for their rugged design, efficient performance, long life and minimum maintenance, whether powered by electric, gasoline, or Diesel equipment. Backed by over ½ century of manufacturing and designing experience, Kurz and Root generators are now serving industries throughout the world

Illustrated are AC generators, only 2 of the many different types developed and designed to fit specific needs and applications, (upper left) two-bearing self-excited type; (lower right) two-bearing direct connected exciter type.

DC generator (left) two - bearings, self excited type Can also be furnished with direct connected exciter. Both AC and DC generators can be furnished in the single bearing, flange-mounted type for special mounting requirements. Ball bearing construction is used throughout. Complete data upon request.

KURZ and ROOT Company

APPLETON • WISCONSIN

Since 1898

.....and DC motor and motor generator sets

STICHT BULLETIN, No. 450 describes the latest addition to the Sticht line of Megohmic (Insulation Testers), the new "Minor" Megohmer.

Sticht "Minor" Megohmer

The greatest feature of this instrument is its light weight (3 lbs.), small size (5⅞" x 3¾" x 5½") and easy portability. The instrument is of the hand crank type, having a DC generator with a 500 volt DC output. The measuring system is of the true ohmmeter cross coil type, which gives deadbeat direct readings independent of generator speed. The scale is well proportioned, clear and legible, and its range is 0-50 megohms and infinity.

Write Herman H. Sticht Company, Inc., 2 Park Place, New York for Bulletin 450.

Sealing and Lubricating Compounds Catalogued

Sealing and lubricating compounds for general purpose and specialized use are described in a new Catalog published by The Parker Appliance Company. Properties of valve lubricants, thread sealing, line sealing, gasket and anti-seize compounds for many types of tubing and piping systems are described. Compounds especially developed for aluminum systems, and systems handling oxygen, alcohol, aromatic and high octane fuels, and other liquids and gases, are among those listed. Write for Catalog No. 909 to Parker Appliance Company, 17325 Euclid Avenue, Cleveland 12, Ohio.

New Guide Booklet to Inland Harbors Published as Free Service

What is believed to be the first cruising guide booklet to harbors of major American lakes and rivers has just been published as a free service to boating enthusiasts by the Cruisegide Bureau of the Gulf Oil Companies. Entitled "Harbors on Inland Waters," the 112-page, pocket-size guide describes many harbors on the Great Lakes and adjacent waterways, Illinois Waterway, New York State Waterways, and the Mississippi, Ohio, and Tennessee Rivers.

A cruise map, believed to be the first to show the entire course of these waterways on a single chart, is attached in a pocket folder of the booklet. Small charts of many harbor areas are shown, together with dock photographs. Information given on the various harbors includes water depth at docks, land highway and transport connections, repair yards, supply and other services available, nearby amusements, athletic attractions, and shopping facilities.

A general reference section lists Government services to boat owners, information for users of

HOW TO BUILD THE PUMP INTO YOUR MACHINERY

Tuthill offers this helpful guide to manufacturers who want to save space, material, labor and money by building the pump directly into the design of their equipment. This bulletin describes two types of Tuthill Stripped Pumps designed for this service: Type S, without mounting bracket; and Type SA, with pumping elements only. Capacities up to 50 g.p.m. Ideal for coolant, lubrication, hydraulic and liquid transfer service. Write for Tuthill Stripped Pump bulletin.

TUTHILL PUMP COMPANY
939 East 95th Street, Chicago 19, Illinois

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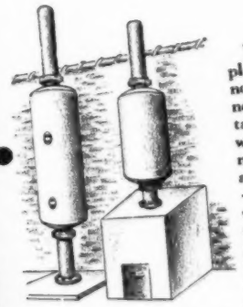
EXHAUST or INTAKE . . .
Keep it *Quiet!*



Typical installation of Burgess-Manning Snubbers.

Your Diesel power plant need not be a noise nuisance to its neighbors. Keep intake and exhaust quiet with Burgess-Manning Matched Intake and Exhaust Snubbers —they *prevent* noise without interfering with efficient engine performance. Pulsating gas flow is smoothed to a quiet stream without harmful restriction. Write for Bulletins.

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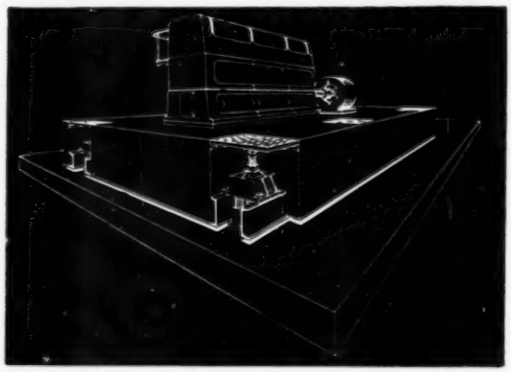
at
DIESEL VIBRATION CONTROL



Korfund Steel Spring Units give *pre-determined* isolation and can be adjusted after installation to conform with exact engine operating conditions.

Korfund Engineering provides highly efficient and economical Vibration Control—whether for a large engine with concrete foundation or a small engine mounted directly on the isolators.

There's a Korfund solution for all your Diesel mounting problems. Write today for free bulletin describing Korfund Diesel Engine Isolation.

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"Specialists in Vibration Control for Over 45 Years"

DIESEL GENERATOR SETS

FOR
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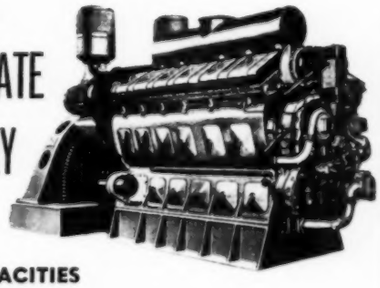

UNIT CAPACITIES
10 TO 1420 KVA

A.C. 50 AND 60 CYCLES
ANY VOLTAGE

Write or wire today for bulletins and complete information regarding these fine fully guaranteed DIESEL ENGINE GENERATING UNITS.

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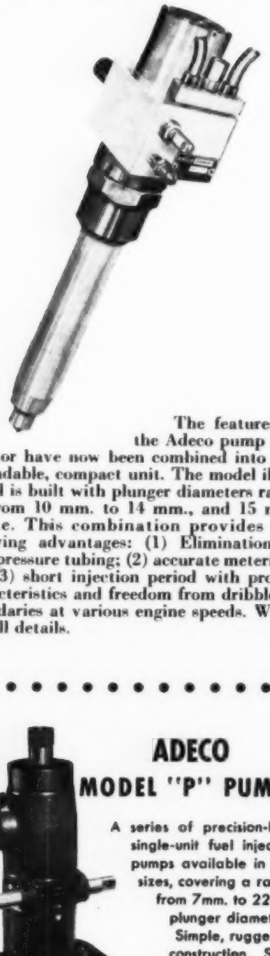
ADECO

UNIT INJECTOR



The features of the Adeco pump and injector have now been combined into one dependable, compact unit. The model illustrated is built with plunger diameters ranging from 10 mm. to 14 mm., and 15 mm. stroke. This combination provides the following advantages: (1) Elimination of high-pressure tubing; (2) accurate metering; and (3) short injection period with proper characteristics and freedom from dribble or secondaries at various engine speeds. Write for full details.

ADECO
MODEL "P" PUMPS

A series of precision-built single-unit fuel injection pumps available in five sizes, covering a range from 7mm. to 22mm. plunger diameters. Simple, rugged in construction. Self-contained for flange mounting. Write for Model "P" Series bulletin.

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AIRCRAFT & DIESEL EQUIPMENT CORP.

4401 N. Ravenswood Avenue
Chicago 40, Illinois

New York State Canals and Canadian Waterways, Coast Guard stations and Coast Guard motorboat requirements, weather information broadcasts, a fuel tax schedule, and other data of value to yachtsmen.

The new booklet has been compiled by the editors of the widely-used Cruisegide books on U. S. coastal harbors from Maine to Mexico, published by the same organization for a number of years. Copies of "Harbors on Inland Waters" may be obtained without charge through Gulf marine dealers or by writing Cruisegide Bureau, Gulf Building, Pittsburgh 30, Pa.

UNDER THE TITLE *Motor Grader Profits That Await the Contractor,* Caterpillar Tractor Co. has issued a two-color, eight-page publication aimed at showing the contractor the extreme versatility of the "Caterpillar" diesel motor graders.

Working alone or in conjunction with tractors, scrapers and bulldozers, the motor grader speeds up the completion of many jobs including backsloping, ditching and final finishing. Light clearing, backfilling and oil mix also come within the scope of its use.

If copies of this booklet are desired they may be obtained by writing to Caterpillar Tractor Co., Peoria 8, Illinois requesting Form 11316.

New Book On Shipbuilding

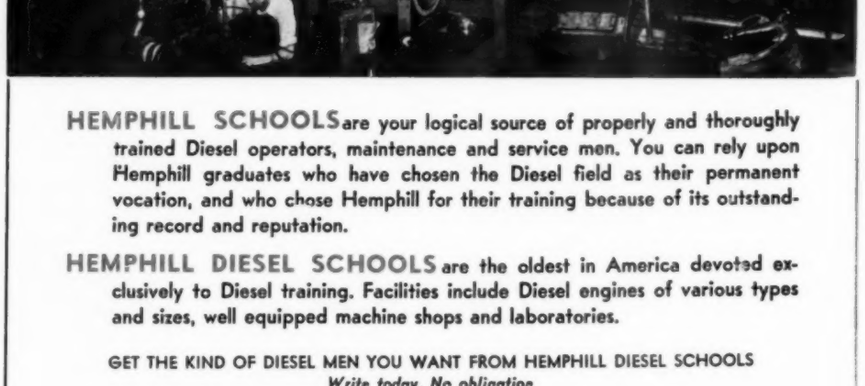
The Society of Naval Architects and Marine Engineers announces a new book on the shipbuilding business in the United States of America, now ready for distribution. This is the first comprehensive treatise of its kind ever to be published, and is titled "The Shipbuilding Business in the United States of America."

Under the guidance of a Control Committee of members of the Society and an experienced editor, a competent technical staff of thirty authors, well known in the industry, has assembled into two compact volumes a comprehensive work on the history, organization and operation of this industry—a business that has proved vital to our National safety in two world wars and today occupies a key position in this country's program to maintain a Merchant Marine and an adequate Navy.

This two-volume publication presents in a non-technical but practical style authoritative material on the many business problems which must be solved economically and promptly in the building and repairing of ships. Among the subjects covered are chapters on cost estimating; production and material control; proposals and contracts; planning, designing and scheduling; procurement and storekeeping; costkeeping and accounting; management controls; marine insurance; inspection; wage systems; shipyard layout and organization; labor; economics and shipbuilding; statistics; history. For further information contact Harold M. Wick, Chairman Publicity Committee SNA&ME c/o American Bureau of Shipping, 45 Broad Street, New York, N. Y.

INCREASING EFFICIENCY for the public utility operator is the main topic of *Public Utilities and the "Caterpillar" Diesel Power That*

TRAINING MEN FOR THE DIESEL INDUSTRY



HEMPHILL SCHOOLS are your logical source of properly and thoroughly trained Diesel operators, maintenance and service men. You can rely upon Hemphill graduates who have chosen the Diesel field as their permanent vocation, and who chose Hemphill for their training because of its outstanding record and reputation.

HEMPHILL DIESEL SCHOOLS are the oldest in America devoted exclusively to Diesel training. Facilities include Diesel engines of various types and sizes, well equipped machine shops and laboratories.

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APPROVED FOR VETERANS—AVAILABLE FOR NON-VETERANS

HOME TRAINING also available. Many men now employed on Diesel jobs take this famous course to upgrade themselves.

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Serves Them, latest publication by Caterpillar Tractor Co.

The publication highlights the many ways "Caterpillar" diesels fill the power needs of public utilities. As diesel tractors, working with specialized auxiliary equipment, they perform many types of material handling work as well as construction and erection. As diesel engines and diesel electric sets, they serve as both prime and standby power sources.

Copies of this publication can be secured from the offices of Caterpillar Tractor Co., Peoria 8, Illinois by requesting Form 11624.

Ross Heater Releases New Bulletin

The complete line of Ross Shell and Tube Heat Exchangers and allied equipment for all industries may be seen at a glance in a new bulletin just published by the manufacturer, Ross Heater & Mfg. Co., Inc. Illustrations of each major item are supplemented by elaborate cutaways and interior views, and accompanied by brief text on design, construction and uses. The makeup of the bulletin, opening from 8½ x 11 file size to a 25½ x 19½ broadside, enables the user to see at a glance the scope and range of the entire Ross line of coolers, heaters, heat exchangers, decalorators, steam jet ejectors, condensers, bubble caps and tube expanders. Copies are available free by writing to Ross Heater & Mfg. Co., Inc., 1407 West Avenue, Buffalo 13, N. Y. and requesting Bulletin No. 4300.

Order Your Copy of the 1948 DIESEL ENGINE CATALOG, Vol. 13 now. Thoroughly revised — more complete — indispensable. Convenient order coupon on page 72 this issue. Mail it today.

FINNFLEX SEAMLESS flexible STEEL HOSE For Diesel Engine Exhaust

- Allows for Expansion and Contraction
- Gastight and Leakproof
- One Piece Construction
- Sizes from 1"-36" I. D.
- Absorbs Vibration

All Sizes Available In Stock.

Hose is necessary on Diesel Engine installations to absorb vibration, and as an expansion joint. For complete information write for Catalog D-101.

FINN & COMPANY

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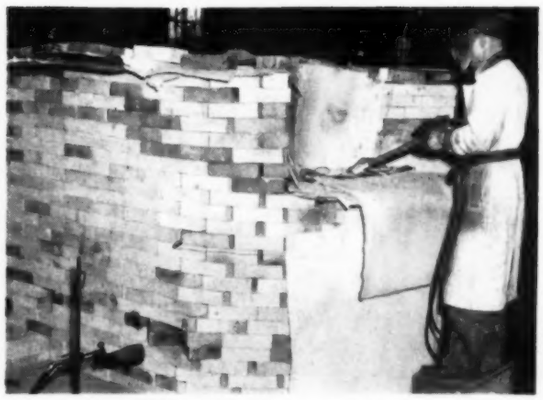
SPECIALIZED DIESEL ENGINE REPAIR BY THE GUTH FUSION PROCESS

In this special furnace, tailored for the job, is a 4 ton diesel engine cylinder. Completely controlled temperatures assure perfect welds by the Guth Fusion Process.



This 48 inch casting being rebored the Guth precision way demonstrates our ability to handle the biggest jobs with assurance of turning out the kind of work you want

The Guth Fusion Process is a scientific method of welding cracked heads, blocks, water jackets, water cooled manifolds . . . or cast iron and aluminum castings of all kinds. Repaired parts are as strong as new. They look like new. They'll give years of service. And you'll save money.

Modern equipment to handle any size repair job. Call or write Guth today for information on any repair jobs you have

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SERVING THE NATION FROM ITS CENTER WITH OVER 30 YEARS EXPERIENCE IN DIESEL ENGINE REPAIR

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Tankers and Barges Only

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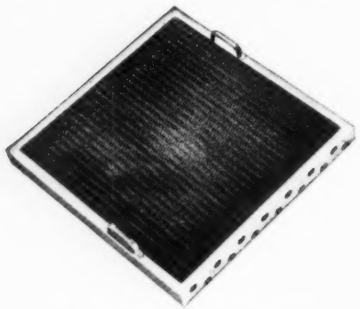
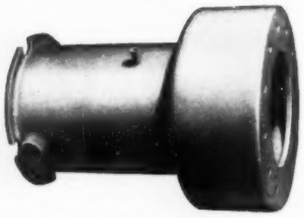
From capturing grease droplets...



Air-Maze Greastop filter panels prevent fire hazards in kitchen ventilating systems.

to hushing air for superchargers . . .



Air-Maze in-line silencers quiet intake noise on supercharged engines.

put your problem up to Air-Maze!

To keep fire-causing grease droplets out of commercial kitchen ventilating systems is one problem—to blanket out undesirable air intake noise on supercharged engines is another. But both jobs involve air. And there's a special Air-Maze product *engineered* to solve each of them—just as there are Air-Maze filters designed to solve scores of filtration problems involving air or liquids.

WHAT'S YOUR FILTERING PROBLEM? Whether you build or use engines, compressors, hydraulic equipment, lubricating or ventilating systems, *or any device using air or liquids*—the chances are there is an Air-Maze *engineered* filter to serve you better. Write Air-Maze Corporation, Cleveland 5, Ohio.

AIR-MAZE

The Filter Engineers

AIR FILTERS
SILENCERS
SPARK ARRESTERS
LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

LEGAL NEWS

By LEO T. PARKER*

Safety Ordinance Void

Unreasonable city ordinances always are void. For instance, in Weinberg v. Northern Pac. Ry. Company, 150 Fed. (2d) 645, it was shown that a city passed an ordinance which specifically prohibits the use of a certain General Electric 44-ton Diesel electric engine in performing certain switching movements in the switching yards, unless the engine be manned with a crew of not less than one qualified engineer or operator and one qualified fireman or helper. In fact this ordinance is formulated to prohibit the use of Diesel switch engines without a fireman or helper to assist the engineer. The city passed the ordinance to "promote and protect the public safety and welfare" within the corporate limits.

The railroad company appealed to the higher court contending that the ordinance is void, because it is unreasonable and proved that similar Diesel engines had been operated for a long time in other cities without endangering the "public safety and welfare."

In holding the ordinance void, the higher court said: "The use of the small Diesel engine with one operator in switching operations in yards where train traffic is dense has been general for some years on a number of other railroads, and the safety of operation thereof as experienced by such other railroads is fully sustained by the evidence. . . . A municipality's right under its police power to interfere in matters of this kind exists only when necessary to the safety and convenience of the public."

Contract Not Mutual

According to a late higher court decision all contracts for sale of Diesel engines are void and unenforceable if either the buyer or seller fails to positively agree to perform definite services or obligations. This means that all valid contracts must positively specify that the seller agrees to sell and the purchaser agrees to purchase the specified engine, otherwise the contract is void, although all other details are clearly expressed.

For instance, in Exchange, Inc., v. Coco, 20 So. (2d) 762, the testimony showed that a buyer and seller signed a contract which contained a clause as follows: "The Party of the Second Part (seller) hereby agrees to sell the Party of the First Part, etc., etc."

The contract contained all other details pertaining to price, quantity, quality, date for delivery, etc., etc. Both the buyer and seller signed this contract. When the time for delivery arrived the seller refused to make the delivery, and the purchaser filed suit to recover $1,440 damages.

The higher court held that the contract was not valid and enforceable, because it imposed no obligation on the purchaser to buy, although it did impose an obligation on the seller to sell.

Salesman "Puffs" Merchandise

Considerable discussion has arisen from time to time over the legal question: When is a salesman's positive statement of good quality of a Diesel engine not a legal guarantee? The answer is: When the salesman merely "puffs" the quality of and performance of the engine, or states his own personal opinion regarding it. In other words, modern higher courts clearly hold that there are some statements which, even though asserted positively, which will not result in the seller being liable on a guarantee no matter how positive the assertion. Such permissible assertions are that the engine is "fine" or "valuable," or "better than productions of rival makers," and the like. See Mars v. Herman, 37 Atl. (2d) 351, reported July, 1944.

Commission to Agents

Considerable discussion has arisen from time to time over the legal question: When is an agent entitled to recover agreed commissions on sale or purchase of engines, appliances, merchandise, etc.? This question is clearly answered in Eastern Machinery Company v. Conroy, 153 Pac. (2d) 521. The facts are that a company is engaged in buying and selling used Diesel engines, machinery and tools. It employs no regular agents, but does pay a commission to persons who direct attention of the company officials to equipment for sale.

A person named Conroy sent the company lists of certain engines, equipment and machinery for sale owned by a firm known as Service Company which asked $15,000 for the complete lot. The company was not willing to pay more than $10,500 for it. After several months the company finally negotiated the purchase of $10,500 without the presence of Conroy. The company refused to pay a commission to Conroy who sued to recover $1,075.

In holding Conroy entitled to a full recovery, the higher court said: "There is evidence from which the jury might reasonably infer that it was Conroy who first obtained an offer from the Service Company to sell its machinery separately from its real estate and that it was largely through defendant that plaintiff (company) was able to purchase."

Therefore, the law is established: An agent is entitled to recover commissions if the testimony proves that his efforts are the foundation upon which the negotiations resulted in the ultimate sale.

---

* *Attorney at Law, Cincinnati, Ohio.*

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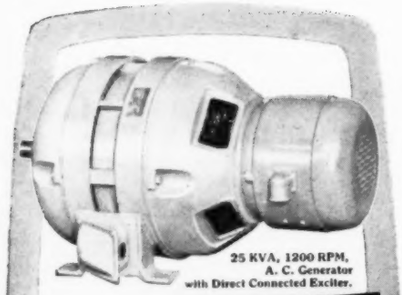

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WEST COAST DIESEL NEWS

By FRED M. BURT

POWERED WITH twin General Motors 71 Series, 165-hp. diesels the *Harbor Sightseer,* first commercial, 230 passenger, glass-enclosed sightseeing boat of its kind built in the Bay area, was recently put into service by Harbor Tug and Barge Co. yards in Alameda, Calif.

PRESENTED BY Roy A. Hundley, Chief Engineer, Enterprise Engine & Foundry Co., before the Northern Calif. Section of "The Society of Naval Architects and Marine Engineers in a summer meeting, was a very interesting and highly analytical paper—"The Designer Had a Reason for It," with the major object—"to describe the major design problems of a diesel engine in order that you may readily understand the processes carried through to the end that presents a saleable, producable, applicable, trouble-free engine."

A NEW 14,700 BARREL oil barge for Marine Dept. Standard Oil Co. of Calif. for inland water service, to be built by Moore Dry Dock Co., will have a Kinney Heliquad rotary pump, 2,000 barrels per hour discharge capacity, powered with a "Caterpillar" diesel of 126-bhp.

FOR SEINER *ALBION,* Roy Peterson owner, a new power plant, a 165-hp. General Motors diesel, installed at Sagstad Yards, Seattle.

THE 60-FT. *LADY OLGA,* of old halibut schooner design, first vessel of its kind built in several years, owned by Western Oceans Fishing and Trading Co., Seattle, is powered with a 90-hp. Washington diesel, turning a Coolidge wheel.

POWERED WITH a 165-hp. General Motors diesel is the 44-ft. trawler, *Mina,* recently constructed by the Hansen Boat Co., Tacoma, Washington for Capt. John Bergman of Westport.

PORTABLE UNITS for the extermination of weeds along highways, by the application of an electric current through a shoe that moves along the ground to "electrocute" the root system, designed and built by the Apco Corp., Los Angeles, have current produced with "Caterpillar" 30-kw. diesel generating sets.

A 110-FT. tuna clipper under construction for M. J. Sousa and Associates, by Martinac Shipbuilding Co., Tacoma, is powered with an 8-cyl. 600-hp. at 450-rpm., 12 x 12, Superior diesel engine.

A 36-FT. HIGGINS boat converted to a diving

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in growing Alaskan community: 530 KW. capacity Diesel Electric public utility power house, seven-room modern residence adjoining distribution system complete. Excellent opportunity for owner manager or investment. Address: Box 488, DIESEL PROGRESS, 2 W. 45th St., New York 19.

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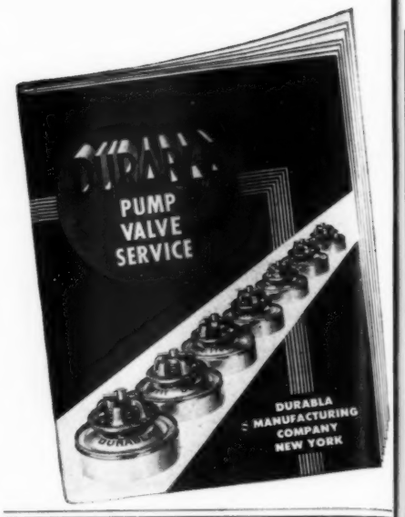
Six new 1947 unused 475 BHP 5 cylinder Baldwin Model VG Diesel Engines, four connected to Ingersoll-Rand Multi-stage Centrifugal Pumps with Farrel-Birmingham Step-up Gears and two connected to Worthington Horizontal Triplex Double Acting Pumps; all units complete with Falk Couplings, Lummus Coolers, other accessories. Location Ohio, immediate delivery. Direct inquiries to The Buckeye Pipe Line Co., Joseph Steele, Purchasing Agent, Room 2200, 30 Broad Street, New York 4, N. Y.



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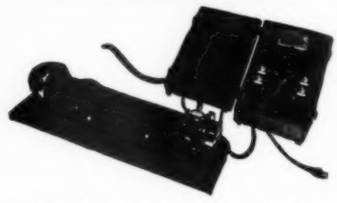

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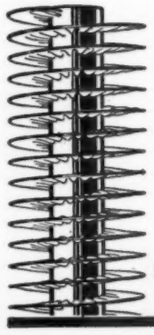

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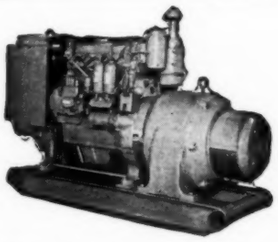

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boat for Arthur Gay of Alameda by Wm. J. Cryer & Sons, Oakland, power is from a 225-hp. GM diesel.

TWO NEW VICE PRESIDENTS of Enterprise Engine & Foundry Co., San Francisco, recently appointed, are Paul Birchard who has been Works Manager since Sept. 1, 1946, and will remain in charge of engineering and manufacturing; and Serge P. Kovaleff who has been General Sales Manager since March 1946.

SUPPLIED BY Shepherd Tractor & Equipment Co., a 65-hp. "Caterpillar" diesel for M. F. Kemper Construction Co., Los Angeles, with four-speed transmission, to replace a gasoline engine in a ditch-digger; a D-318 "Caterpillar" diesel, 98-hp., for Inyo County road work.

THE 148-FT. 500-ton. hold capacity, *Reefer King*, combining Bering Sea trawling with freezing and delivering Bristol Bay salmon, to Puget Sound canneries, has a new 175-hp. Cummins diesel direct-connected to G.E. generator for operation of refrigeration machinery; propulsion diesel is an 875-hp. Fairbanks-Morse, with two 60-hp. F-M diesels for auxiliaries.

BUILT BY Puget Sound Boat Building Co., Tacoma, for Capt. Joaquin Canas, his fifth tuna clipper in ten years, the *Mary C. Canas* on maiden trip fishing for Van Camp Sea Food Co., San Diego, has a pair of 125-hp. G.M. diesels for auxiliary power; propulsion with a 425-hp. diesel.

THE 52-MILE, Eagle Mountain Railroad, running from the 25,000,000 ton, Eagle Mountain iron ore deposit in Southern California, to connect with the Southern Pacific at the Salton Sea; the first private railroad built in the United States since 1926, at a cost of $3,800,000, to carry ore to the Kaiser Steel plant at Fontana, has just received a 1500-hp. Baldwin diesel-electric locomotive to haul the strings of gondola cars.

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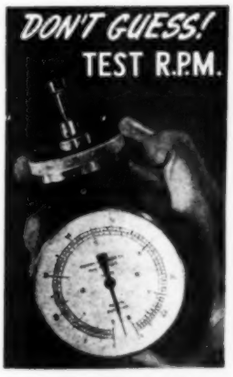

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